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LISTS OF SPECIES

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Serra do Urubu, a biodiversity hot-spot for angiosperms in the northern Atlantic Forest (Pernambuco, Brazil)

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Abstract: A list of angiosperms from Serra do Urubu, a montane forest area in the state of Pernambuco, is here provided. Based on 14 botanical expeditions and material deposited in herbaria, 832 taxa belonging to 442 genera and 118 families have been recorded in this area, with about 90% of the taxa identified to species level. The richest families are Orchidaceae (86 spp.), Fabaceae (51 spp.) and Rubiaceae (42 spp.). *Miconia* and *Solanum* (14 spp. each), and *Psychotria* (13 spp.) are the richest genera. About 15% of the recorded species are endemic to the Atlantic Forest, and another 10% are disjunct between this area and the Amazon Rainforest. The results indicate that the Serra do Urubu is one of the richest areas in terms of number of species of the Atlantic Forest in the Northeast, and corroborates the Pernambuco Endemism Center.

Key words: Brazilian Northeast; endemic species; floristics; hotspot; rock outcrops

INTRODUCTION

The Atlantic Forest is considered one of the world's 34 biodiversity hotspots, possesses high species richness and endemism levels, a wide latitudinal extension (3°S-30°S) and various types of vegetation, yet despite this, only about 7-12% of its original area remains (Myers et al. 2000; Mittermeier et al. 2004; Ribeiro et al. 2009). Myers et al. (2000) estimated that there were 20,000 species of plants, of which 8,000 (40%) were endemic to this region and subsequently Stehmann et al. (2009), in a more detailed compilation, recorded 15,782 species for the Brazilian Atlantic Forest, with 13,708 angiosperms, of which 49% were considered endemic. Based on the discovery of new species and the general advancement of knowledge of Brazilian plants, the *Lista de Espécies da Flora do Brasil* (2015) enumerates 15,282 species of flowering plants in the Atlantic Forest domain, and of these, 8,601 (56.3%) are endemic. The Atlantic Forest is first among Brazilian domains for threatened species (1,544 species), in addition to those that have insufficient data (265) and those which are not endangered but are considered of interest for conservation and research (337) (Livro Vermelho da Flora do Brasil 2013).

According to Stehmann et al. (2009), Orchidaceae, Fabaceae, Asteraceae, Bromeliaceae, Poaceae, Myrtaceae, Melastomataceae and Rubiaceae are the most representative families in the Atlantic Forest. Bromeliaceae and Orchidaceae especially noteworthy for their high richness and endemism. Local floristic surveys along the Atlantic Forest demonstrate that these families figure among the richest in distinct areas of this domain, but in different proportions depending on, for example, altitude, latitude, and vegetation type (Barros et al. 1991; Alves-Araújo et al. 2008; Amorim et al. 2008, 2009; Scheer and Kinoshita 2009; Coelho and Amorim 2014; Forzza et al. 2014; Landim et al. 2015).

Floristic inventories of the Atlantic Forest in Pernambuco were performed in areas of restingas and lowland forests (up to 100 m in altitude) by Guedes (1998), Rodal et al. (2005a), Almeida Jr. et al. (2007, 2009), Sacramento et al. (2007), Soares Júnior et al. (2008), Pessoa et al. (2009), Cavalcanti (2012) and Alves et al. (2013). These inventories point out the taxonomic diversity that ranges from 101 to 830 species, demonstrating the high species richness of some areas (Cavalcanti 2012; Alves et al. 2013). Inventories that include areas of submontane and montane forests (above 100 m altitude) in the state are scarcer (Rodal et al. 2005b; Barreto et al. 2006; Grillo et al. 2006; Rodal and Sales 2007; Ferraz and Rodal 2008); they document the number of angiosperm species as between 69 and 375.

The Catende Complex (which includes Serra do Urubu) is located in the southern portion of the state of Pernambuco and is indicated by the MMA (2007) as

of extreme biological importance and is considered a priority area for conservation of the flora of the Atlantic Forest domain (Martinelli 2007). The area has been the subject of many studies showing great diversity of birds (Roda 2002; Bencke et al. 2006), frogs (Santos and Carnaval 2002), lycophytes and ferns (Barros et al. 2006), Bromeliaceae and Orchidaceae (Leme and Siqueira-Filho 2006; Siqueira-Filho and Felix 2006; Pessoa and Alves 2015b), and even new taxa to science (Carnaval and Peixoto 2004; Chautems et al. 2005; Leme and Siqueira-Filho 2006; Amorim and Alves 2012a, 2015; Costa-Lima and Alves 2013; Giacomin et al. 2013; Gregório et al. 2014; Pessoa and Alves 2015a; Pessoa et al. 2014a, 2014b; Sobral 2013).

Therefore, the objectives of this study were the following: (1) to perform an inventory of angiosperms in remnant \montane forests in the southern portion of the state of Pernambuco, (2) to corroborate the floristic patterns observed in other areas of Atlantic Forest in the region (the richest families, habits and similarity between areas based on representative taxonomic groups), (3) to document new occurrences for the state of Pernambuco and species with some degree of threatened or rare status.

MATERIALS AND METHODS

The floristic survey was carried out in the Serra do Urubu (08°42′48″ S, 035°50′38″ W), located between the municipalities of Lagoa dos Gatos, Jaqueira and São Benedito do Sul, in the Zona da Mata Sul in the state of Pernambuco, about 160 km from Recife (Figure 1). Besides being considered by MMA (2007) as a priority conservation area for the Atlantic Forest domain, the municipality of Jaqueira was indicated by Martinelli (2007) as an area of extreme importance, requiring priority action to carry out an inventory and create a protected area. In addition, Jaqueira was highlighted by Kasecker et al. (2009) as a Key Biodiversity Area, based on the presence of a rare species of Bromeliaceae (*Neoregelia pernambucana* Leme & J.A. Siqueira-Filho).

The area is characterized as the border between montane and submontane seasonal forest (*sensu* Veloso et al. 1991), consisting of areas of remaining forest and rock outcrops, and surrounded by areas of sugar-cane (Usina Colônia), livestock and subsistence agriculture on small farms. The average rainfall between 1994 and 2013 was 1373.1 mm/year (data from the headquarters of Usina Colônia). The altitude varies between 600 and 780 m, and the area experiences fog at the highest points during the winter months, as well as having ponds and streams.

Samples were collected in the private area of Private Reserve of Natural Patrimony (PRNP) Frei Caneca, owned by Usina Colônia, and PRNP Pedra D'Anta, belonging to Society for Conservation of Birds of Brazil (SAVE Brasil), which are adjacent areas and together form a continuous fragment of approximately 1,000 ha of Atlantic Forest in the Serra do Urubu (Bencke et al. 2006). Field expeditions were conducted between August 2010 and December 2014, including both the dry and rainy seasons, totaling 14 trips and approximately 50 days of sampling effort. The material collected was treated according to the usual botanical techniques (Peixoto and Maia 2013) and deposited at Herbarium UFP with duplicates distributed to the herbaria ASE, FRA, HRCB, JPB, NY, RB and UFRN (acronyms according to Thiers 2015).

Identification of the material was performed by consulting the taxonomic literature, the collections of the UFP and JPB herbaria and specialists as indicated in Table 1. The classification of families, name of the species, abbreviations of authors, geographical distribution and

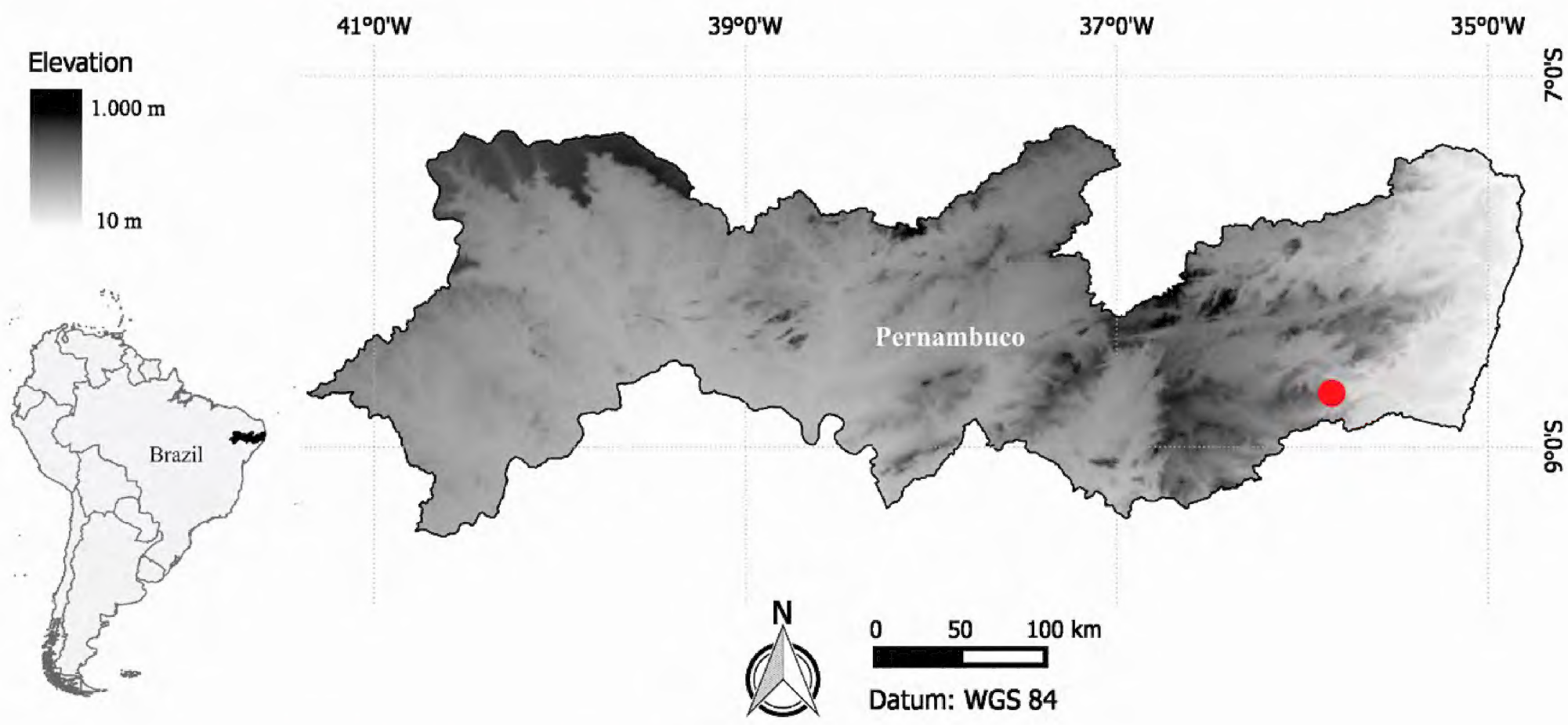

Figure 1: Map showing the location of the Serra do Urubu, Pernambuco state.

conservation status followed the *Lista de Espécies da Flora do Brasil* (2015) and the *Livro Vermelho da Flora do Brasil* (2013). The list presented here is mainly the product of collections made during this work, but other vouchers collected previously in the study area and deposited in the herbaria HST (Herbarium of Forestry, Federal Rural University of Pernambuco - not indexed), JPB and UFP were also used.

The identified species were categorized into structural groups as (1) Herbs, (2) Bushes, (3) Trees and related forms (including treelets and arborescent plants like palms and bamboo) and (4) Climbers (woody or herbaceous vines). A further categorization was also adopted for the substrate: (1) Terrestrial, (2) Saxicolous (3) Epiphytic and/or Hemi-epiphytic and (4) Aquatic or Wetland. It is noteworthy that in this case, some species occupy more than one type, which is a common condition in some representatives of Araceae, Bromeliaceae and Orchidaceae. Finally, the species were organized into groups based on their source of nutrition: (1) Autotrophic, (2) Heterotrophic (parasitic or hemiparasitic) or (3) Mycoheterotrophic.

RESULTS

In the study area 832 taxa were recorded, belonging to 442 genera and distributed in 118 families. About 90% of the morphotypes were identified to the species level (750 spp.), 6% only to genus (50), 3% to family level and the remaining 1% undetermined. The most representative families were Orchidaceae (86 species), Fabaceae (51 spp.), Rubiaceae (42 spp.), Bromeliaceae (41 spp.), Poaceae (40 spp.), Cyperaceae (34 spp.), Asteraceae (31 spp.), Melastomataceae (30 spp.) , Solanaceae (24 spp.) and Myrtaceae (23 spp.), comprising about 50% of the species found in the area. The richest families in number of species also have greater richness in genera such as Orchidaceae (51 genera), Fabaceae (30), Poaceae (24),

Table 1. List of the 750 taxa of angiosperms identified to species level of the Serra do Urubu. The species follow in alphabetical order of family and species, respectively, with information of habit and voucher specimens of the referenced taxon. Samples are deposited in HST, JPB and UFP. * Alien species. ** Name followed Zanotti et al. (2012).

Family	Species	Habit	Voucher
Acanthaceae (Bruno S. Amorim)			
	Dicliptera mucronifolia Ness	Subshrub	J.L. Viana et al. 351
	Hygrophila costata Nees	Subshrub	J.L. Viana et al. 76
	Justicia symphyantha (Nees *ex* Mart) Lindau	Subshrub	D. Araújo et al. 1751
	Ruellia cearensis Lindau	Shrub	B.S. Amorim et al. 1056
	Ruellia geminiflora Kunth	Subshrub	J.L. Viana et al. 198
	Ruellia menthoides (Nees) Hiern	Subshrub	E. Pessoa and A. Melo 472
	Ruellia ochroleuca Mart. *ex* Nees	Subshrub	G.A. Gomes-Costa et al. 196
Alismataceae (James L. Costa-Lima)			
	Helanthium tenellum (Martius) Britton	Herb	J.L. Costa-Lima et al. 863
Alstroemeriaceae (Aline Melo)			
	Bomarea edulis (Tussac) Herb.	Herbaceous climber	G.A. Gomes-Costa et al. 218
Amaryllidaceae (Anderson Alves-Araújo)			
	Hippeastrum puniceum (Lam.) Kuntze	Herb	J.L. Viana et al. 338
	Hippeastrum stylosum Herb.	Herb	E. Pessoa and A. Melo 445
Anacardiaceae (Bruno S. Amorim)			
	Anacardium occidentale L.	Tree	B.S. Amorim et al. 1287
	Tapirira guianensis Aubl.	Tree	A. Melo et al. 572
	Thyrsodium spruceanum Benth.	Tree	A. Melo et al. 785
Annonaceae (Aline Melo and Bruno S. Amorim)			
	Anaxagorea dolichocarpa Sprague & Sandwith	Tree	S.O. Santos et al. 178
	Annona montana Macfad.	Tree	B.S. Amorim et al. 1265
	Cymbopetalum brasiliense (Vell.) Benth. *ex* Baill.	Tree	D. Araújo et al. 1898
	Guatteria pogonopus Mart.	Tree	E. Pessoa et al. 458
	Guatteria oligocarpa Mart.	Tree	M.A. Chagas et al. 16
	Xylopia frutescens Aubl.	Tree	A. Melo et al. 783
Apiaceae (Bruno S. Amorim)			
	Spananthe paniculata Jacq.	Herb	A. Melo et al. 569
Apocynaceae (Aline Melo, Diogo Araújo and Thales Coutinho)			
	Allamanda cathartica L.	Shrub-Tree	S.O. Santos et al. 177
	Aspidosperma spruceanum Benth. *ex* Müll.Arg.	Tree	B.S. Amorim et al. 1263
	Blepharodon pictum (Vahl) W.D. Stevens	Woody climber	D. Araújo et al. 1872
	Ditassa oxyphylla Turcz.	Woody climber	J.L. Costa-Lima et al. 746
	Himatanthus bracteatus (A. DC.) Woodson	Tree	E. Pessoa and A. Melo 474
	Mandevilla dardanoi M.F.Sales, Kin-Gouv. & A.O. Simões	Shrub	B.S. Amorim et al. 966
	Mandevilla hirsuta (A.Rich.) K.Schum.	Woody climber	T.S. Coutinho et al. 71
	Mandevilla microphylla (Stadelm.) M.F.Sales & Kin.-Gouv.	Woody climber	T.S. Coutinho et al. 43

Continued

Table 1. *Continued.*

Family	Species	Habit	Voucher
	Mandevilla scabra (Hoffmanns. *ex* Roem. & Schult.) K. Schum.	Woody climber	A. Melo et al. 568
	Marsdenia loniceroides (Hook.) E. Four.	Shrub	A. Melo et al. 460
	Matelea ganglinosa (Vell.) Rapini	Herbaceous climber	J.L. Costa-Lima et al. 747
	Matelea orthosioides (E. Fourn.) Fontella	Woody climber	D. Araújo et al. 1773
	Oxypetalum cf. harleyi (Fontella & Goyder) Farinaccio	Woody climber	B.S. Amorim et al. 1785
	Peltastes peltatus (Vell.) Woodson	Woody climber	A. Melo et al. 757
	Rauvolfia grandiflora Mart. *ex* A. DC.	Shrub-Tree	M.A. Chagas et al. 7
	Rauvolfia moricandii A.DC.	Tree	S.O. Santos et al. 188
	Tabernaemontana flavicans Willd. *ex* Roem. & Schult.	Shrub	G.A. Gomes-Costa et al. 195
Araceae (Jefferson R. Maciel and Bruno S. Amorim)			
	Anthurium affine Schott	Herb	E. Pessoa et al. 496
	Anthurium bromelicola Mayo & L.P. Félix	Herb	D. Araújo et al. 2418
	Anthurium gracile (Rudge) Lindl.	Herb	A. Melo et al. 652
	Anthurium pentaphyllum (Aubl.) G. Don.	Herb	B.S. Amorim et al. 1042
	Anthurium scandens (Aubl.) Engl.	Herb	A. Melo et al. 758
	Caladium bicolor (Aint.) Vent.	Herb	D. Araújo et al. 2392
	Monstera adansonii var. *klotzschiana* (Schott) Madson	Herb	B.S. Amorim et al. 1596
	Philodendron acutatum Schott	Herb	E.D. Mendonça et al. 49
	Philodendron ornatum Schott	Herb	B.S. Amorim et al. 907
	Philodendron pedatum (Hook.) Kunth	Herb	B.S. Amorim et al. 1264
	Philodendron rudgeanum Schott	Herb	D. Araújo et al. 1935
	Syngonium vellozianum Schott	Herb	B.S. Amorim et al. 915
	Zomicarpa pythonium (Mart.) Schott	Herb	A. Melo et al. 744
Araliaceae (Bruno S. Amorim)			
	Oreopanax capitatus (Jacq.) Decne. & Planch.	Tree	A. Viana et al. 529
	Schefflera morototoni (Aubl.) Maguire *et al.*	Tree	B.S. Amorim et al. 1579
Arecaceae (Diogo Araújo)			
	Bactris acanthocarpa Mart.	Arborescent	B.S. Amorim et al. 1068
	Desmoncus aff. *phoenicocarpus* Barb.Ro	Shrub	D.S. Correia et al. 83
	Desmoncus polyacanthos Mart.	Woody climber	D. Araújo et al. 2446
	Euterpe edulis Mart.	Arborescent	A. Melo et al. 709
	Geonoma pauciflora Mart.	Arborescent	D. Araújo et al. 1766
	Geonoma pohliana Mart.	Arborescent	S.O. Santos et al. 303
Aristolochiaceae (Ariclenes Araújo)			
	Aristolochia labiata Willd	Woody climber	B.S.Amroim et al. 906
Asteraceae (Suéllen O. Santos and Jéssica L. Viana)			
	Acmella uliginosa (Sw.) Cass.	Herb	S.O. Santos et al. 194
	Ageratum conyzoides L.	Herb	S.O. Santos et al. 175
	Baccharis cf. *malmei* Joch. Müll.	Shrub	J.L. Costa-Lima et al. 878
	Chresta pacourinoides (Mart. *ex* DC.) Siniscalchi & Loeuille	Herb	S.O. Santos et al. 288
	Conocliniopsis prasiifolia (DC.) R.M. King & H. Rob.	Subshrub	J.L. Viana et al. 314
	Cosmos caudatus Kunth	Herb	S.O. Santos et al. 312
	Cyrtocymura scorpioides (Lam.) H. Rob.	Subshrub	S.O. Santos et al. 174
	Diacranthera crenata (Schldtl. *ex* Mart.) R.M. King & H. Rob.	Shrub	D. Araújo et al. 1754
	Elephantopus mollis Kunth.	Herb	J.L. Viana et al. 316
	Emilia fosbergii Nicolson	Herb	A. Melo et al. 689
	Emilia sonchifolia (L.) DC. *ex* Wight	Herb	A. Melo et al. 450
	Erechtites valerianifolius (Wolf) DC.	Herb	J.L. Viana et al. 348
	Lepidaploa acutangula (Gardner) H. Rob.	Shrub	D. Araújo et al. 1719
	Mikania cf. *biformis* DC.	Woody climber	J. Leal et al. 45
	Mikania micrantha Kunth	Woody climber	E. Pessoa and A. Melo 486
	Mikania psilostachya DC.	Woody climber	S.O. Santos et al. 193
	Mikania cf. *ternata* (Vell.) B.L. Rob.	Herbaceous climber	D. Araújo et al. 1728
	Pterocaulon cf. *alopecuroides* (Lam.) DC.	Subshrub	D. Araújo et al. 1922
	Rolandra fruticosa (L.) Kuntze	Subshrub	A. Melo et al. 627
	Sonchus oleraceus L.	Herb	S.O. Santos et al. 301
	Sphagneticola trilobata (L.) Pruski	Herb	J.L. Viana et al. 250
	Tilesia baccata (L. *f.*) Pruski	Shrub	J.L. Viana et al. 196
	Vernonanthura brasiliana (L.) H. Rob.	Shrub	E. Pessoa and A. Melo 469
Begoniaceae (Aline Melo and Katarina Pinheiro)			
	Begonia lealii Brade	Herb	A. Melo et al. 461
	Begonia obdeltata Gregório & E.L. Jaques	Herb	K. Pinheiro et al. 13
	Begonia reniformis Dryand	Herb	E. Pessoa and A. Melo 464
	Begonia saxicola A. DC.	Herb	A. Melo et al. 651

Continued

Table 1. *Continued.*

Family	Species	Habit	Voucher
Bignoniaceae (Diogo Araújo)			
	Adenocalymma comosum (Cham.) DC.	Woody climber	E.D. Mendonça et al. 67
	Bignonia corymbosa (Vent.) L.G. Lohmann	Woody climber	G.A. Gomes-Costa et al. 193
	Handroanthus chrysotriches (Mart *ex* A.DC.) Mattos	Tree	B.S. Amorim et al. 1846
	Lundia longa (Vell.) DC.	Woody climber	E. Pessoa et al. 476
Boraginaceae (José I. Melo)			
	Cordia nodosa Lam.	Shrub	J.B.S. Oliveira et al. 81
	Cordia sellowiana Cham	Shrub	B.S. Amorim et al. 1235
	Varronia multispicata (Cham.) Borhidi	Shrub-Tree	B.S. Amorim et al. 778
	Varronia polycephala Lam.	Shrub	E. Pessoa et al. 487
Bromeliaceae (Jefferson R. Maciel, Rafael Louzada, Gardene M. Sousa and Maria G. Wanderley)			
	Aechmea catendensis J.A. Siqueira-Filho & Leme	Herb	J.R. Maciel et al. 1914
	Aechmea cephaloides J.A. Siqueira & Leme	Herb	J.R. Maciel et al. 2012
	Aechmea costantinii (Mez) L.B. Sm.	Herb	J.R. Maciel et al. 1926
	Aechmea fulgens Brongn.	Herb	J.R. Maciel et al. 1909
	Aechmea gustavoi J.A. Siqueira & Leme	Herb	J.R. Maciel et al. 1929
	Aechmea leptantha (Harms) Leme & J.A. Siqueira	Herb	J.R. Maciel et al. 1925
	Aechmea mertensii (G. Mey.) Schult. & Schult. *f.*	Herb	E. Pessoa et al. 437
	Aechmea patentisssima (Mart. *ex* Schult. & Schult. *f.*) Baker	Herb	J.R. Maciel et al. 1912
	Aechmea pernambucentris J.A. Siqueira & Leme	Herb	J.A. Siqueira 736
	Aechmea serragrandensis Leme & J.A. Siqueira	Herb	J.R. Maciel et al. 2008
	Ananas comosus (L.) Merril	Herb	J.A. Siqueira-Filho 1089
	Araeococus chlorocarpus (Wawra) Leme & J.A. Siqueira	Herb	J.R. Maciel et al. 1915
	Billbergia morelii Brongn.	Herb	A. Melo et al. 770
	Bromelia karatas L.	Herb	B.S. Amorim 786
	Canistrum aurantiacum E. Morr.	Herb	J.R. Maciel et al. 1912
	Canistrum pickelii (A. Lima & L.B. Sm.) Leme & J.A. Siqueira	Herb	J.R. Maciel et al. 1927
	Catopsis berteroniana (Schult. & Schult. *f.*) Mez	Herb	J.A. Siqueira-Filho 1008
	Cryptanthus dianae Leme	Herb	B.S. Amorim et al. 1609
	Guzmania lingulata (L.) Mez	Herb	A. Viana 330
	Guzmania monostachia (L.) Rusby *ex* Mez.	Herb	J.A. Siqueira-Filho 2750
	Hohenbergia cf. *catingae* Ule	Herb	J.A. Siqueira-Filho 1198
	Hohenbergia ramageana Mez	Herb	E. Pessoa and A. Melo 477
	Hohenbergia ridleyi (Baker) Mez	Herb	J.A. Siqueira-Filho 691
	Lymania smithii R.W. Read	Herb	B.S. Amorim et al. 894
	Neoregelia pernambucana Leme & J.A. Siqueira	Herb	J.A. Siqueira 1000
	Orthophytum disjunctum L. B. Sm.	Herb	B.S. Amorim et al. 787
	Pseudananas sagenarius (Arruda) Camargo	Herb	J.A. Siqueira-Filho and M.J.A. Campelo 743
	Racinaea spiculosa (Griseb.) M.A. Spencer & L.B. Sm.	Herb	B.S. Amorim et al. 982
	Tillandsia bulbosa Hook. *f.*	Herb	B.S. Amorim et al. 959
	Tillandsia gardneri Lindl.	Herb	J.A. Siqueira-Filho 746
	Tillandsia tenuifolia L.	Herb	J.A. Siqueira-Filho 977
	Tillandsia usneoides (L.) L.	Herb	E. Pessoa and A. Melo 454
	Vriesea cf. *atra* Mez	Herb	E. Pessoa et al. 510
	Vriesea barbosae J.A. Siqueira & Leme	Herb	J.A. Siqueira-Filho 1207
	Vriesea ensiformis (Vell.) Beer	Herb	J.A. Siqueira-Filho 1011
	Vriesea flammea L.B. Sm.	Herb	J.A. Siqueira-Filho 973
	Vriesea freicanecana J.A. Siqueira & Leme	Herb	E. Pessoa et al. 495
	Vriesea gigantea Gaudich.	Herb	J.A. Siqueira-Filho 1240
	Vriesea procera (Mart. *ex* Schult. & Schult. *f.*) Wittm.	Herb	J.A. Siqueira-Filho 821
	Vriesea tijucana E. Pereira	Herb	J.A. Siqueira-Filho 740
	Vriesea wawranea Antoine	Herb	J.A. Siqueira-Filho 1010
Burmanniaceae (Aline Melo)			
	Burmannia capitata (Walter *ex* J.F.Gmel.) Mart.	Herb	A. Melo et al. 640
	Campylosiphon purpurascens Benth.	Herb	A. Melo et al. 1129
	Gymnosiphon divaricatus (Benth.) Benth. & Hook. *f.*	Herb	A. Melo et al. 470
Burseraceae (Aline Melo and Ricardo Perdiz)			
	Protium aracouchini (Aubl.) Marchand	Tree	B.S. Amorim et al. 1747
	Tetragastris cf. *catuaba* Soares da Cunha	Tree	G.A. Gomes-Costa et al. 181
Cactaceae (Bruno S. Amorim)			
	Epiphyllum phyllanthus (L.) Haw	Herb	E. Pessoa et al. 511
	Rhipsalis cereuscula Haw.	Herb	B.S. Amorim et al. 1606
Campanulaceae (André Amorim)			
	Centropogon cornutus (L.) Druce	Herb	E. Pessoa and A. Melo 459

Continued

Table 1. *Continued.*

Family	Species	Habit	Voucher
	Lobelia xalapensis Kunth	Herb	J.L. Viana et al. 327
Cannabaceae (Bruno S. Amorim)			
	Trema micrantha (L.) Blume	Tree	B.S. Amorim et al. 1239
Caricaceae (Bruno S. Amorim)			
	Jacaratia spinosa (Aubl.) A. DC.	Tree	B.S. Amorim et al. 953
Caryophyllaceae (James L. Costa-Lima)			
	Drymaria cordata (L.) Willd. *ex* Roem. & Schult.	Herb	J.L. Costa-Lima et al. 707
Celastraceae (Bruno S. Amorim)			
	Maytenus distichophylla Mart. *ex* Reissek	Tree	B.S. Amorim et al. 940
Chrysobalanaceae (Bruno S. Amorim)			
	Couepia impressa Prance	Tree	B.S. Amorim et al. 1779
Clusiaceae (Aline Melo and Katarina Pinheiro)			
	Clusia nemorosa G. Mey.	Tree	E. Pessoa and A. Melo 484
	Symphonia globulifera L. *f.*	Tree	D. Araújo et al. 1937
	Tovomita mangle G. Mariz	Tree	A. Melo et al. 708
Combretaceae (Aline Melo)			
	Buchenavia tetraphylla (Aubl.) R.A. Howard	Tree	J.L. Costa-Lima et al. 740
Commelinaceae (Roxana Barreto)			
	Callisia repens L.	Herb	E. Pessoa et al. 1292
	Commelina difusa Burm. f.	Herb	J.L. Viana et al. 286
	Commelina rufipes Seub	Herb	J.L. Viana et al. 283
	Dichorisandra hexandra (Aubl.) Kuntze *ex* Hand.-Mazz.	Herb	J.L. Viana et al. 293
	Dichorisandra thyrsiflora J.C. Mikan	Herb	J.L. Viana & E.O. Machado 305
	Gibasis geniculata (Jacq.) Rohweder	Herb	J.L. Viana et al. 91
Connaraceae (Bruno S. Amorim)			
	Connarus blanchetii Planch.	Woody climber	A. Melo et al. 760
Convolvulaceae (Maria T. Buril)			
	Ipomoea bahiensis Willd. *ex* Roem. & Schult.	Herbaceous climber	B.S. Amorim et al. 965
	Ipomoea hederifolia L.	Herbaceous climber	A. Viana et al. 509
	Ipomoea indica (Burm.) Merr.	Herbaceous climber	D. Araújo et al. 2395
	Ipomoea philomega (Vell.) House	Herbaceous climber	B.S. Amorim et al. 970
	Ipomoea setosa Ker Gawl.	Herbaceous climber	B.S. Amorim et al. 1078
	Ipomoea tiliacea (Willd.) Choisy	Herbaceous climber	M.T. Buril et al. 622
	Jacquemontia bifida Hallier	Herbaceous climber	B.S. Amorim et al. 1036
	Jacquemontia sphaerostigma (Cav.) Rusby	Herbaceous climber	B.S. Amorim et al. 1298
	Merremia aegyptia (L.) Urb.	Herbaceous climber	S.O. Santos et al. 291
	Merremia macrocalyx (Ruiz & Pav.) O'Donell	Herbaceous climber	A. Melo et al. 602
Costaceae (Aline Melo)			
	Costus spiralis (Jacq.) Roscoe	Herb	A. Melo et al. 771
Cucurbitaceae (Diogo Araújo and Géssica Gomes-Costa)			
	Cayaponia tayuya (Vell.) Cogn.	Herbaceous climber	G.A. Gomes-Costa et al. 208
	Fevillea trilobata L.	Herbaceous climber	A.M. Miranda et al. 1450
	Gurania bignoniacea (Poepp. & Endl.) C. Jeffrey	Herbaceous climber	A. Melo et al. 648
	Gurania lobata (L.) Pruski	Herbaceous climber	A. Melo et al. 762
	Gurania subumbellata (Miq.) Cogn.	Herbaceous climber	G.A. Gomes-Costa et al. 179
	Momordica charantia L.	Herbaceous climber	B.S. Amorim et al. 925
	Psiguria triphylla (Miq.) C. Jeffrey	Herbaceous climber	G.A. Gomes-Costa et al. 198
Cyclanthaceae (Katarina Pinheiro)			
	Asplundia gardnerii (Hook) Harling	Herb	D. Araújo et al. 1784
Cyperaceae (Marccus Alves and William W. Thomas)			
	Becquerelia cymosa Brongn.	Herb	D. Araújo et al. 1722
	Bulbostylis scabra (J. Presl & C. Presl) C.B. Clarke	Herb	A. Melo et al. 658b
	Cyperus distans L.	Herb	A. Melo et al. 616
	Cyperus haspan Rottb.	Herb	D. Araújo et al. 2371
	Cyperus laxus Lam.	Herb	D. Araújo et al. 1774
	Cyperus luzulae (L.) Retz	Herb	D. Araújo et al. 1882
	Cyperus odoratus L.	Herb	S. Martins et al. 239
	Cyperus surinamensis Rottb	Herb	J.R. Maciel et al. 1996
	Eleocharis flavescens (Poir.) Urb.	Herb	A. Melo et al. 665
	Eleocharis intersticta (Vahl) Roem & Schult.	Herb	J.R. Maciel et al. 2004
	Eleocharis minima Kunth	Herb	J.L. Costa-Lima et al. 855
	Fimbristylis autumnalis (L.) Roem. & Schult.	Herb	A. Melo et al. 617
	Fimbristylis complanata (Retz.) Link	Herb	J.R. Maciel et al. 1993
	Fimbristylis miliacea (L.) Vahl.	Herb	J.L. Costa-Lima et al. 854

Continued

Table 1. *Continued.*

Family	Species	Habit	Voucher
	Fuirena umbellata Rottb.	Herb	D. Araújo et al. 2370
	Hypolytrum bullatum C.B. Clarke	Herb	W.W. Thomas et al. 15288
	Hypolytrum schraderianum Nees	Herb	G.A. Gomes-Costa et al. 211
	Kyllinga odorata Vahl	Herb	A. Melo et al. 614
	Kyllinga squamulata Thonn. *ex* Vahl	Herb	J.R. Maciel et al. 2001
	Lipocarpha salzmanniana Steud.	Herb	A. Melo et al. 621
	Pycreus polystachyos (Rottb.) P. Beauv.	Herb	J.R. Maciel et al. 2003
	Rhynchospora cephalotes (L.) Vahl	Herb	A. Melo et al. 664
	Rhynchospora ciliata Kük.	Herb	A. Melo et al. 615
	Rhynchospora emaciata (Nees) Boeckeler	Herb	A. Melo et al. 658
	Rhynchospora exaltata Kunth	Herb	D. Araújo et al. 1738
	Rhynchospora nervosa (Vahl) Boeckeler	Herb	J.L. Viana et al. 300
	Rhynchospora pubera (Vahl) Boek.	Herb	J.R. Maciel et al. 2000
	Rhynchospora radicans (Schltdl. & Cham.) H. Pfeiff.	Herb	J.L. Viana et al. 299
	Scleria bracteata Cav.	Herb	W.W. Thomas et al. 15306
	Scleria distans Poir.	Herb	A.C. Araújo et al. 1767
	Scleria hirtella Sw.	Herb	D. Araújo et al. 1740
	Scleria latifolia Sw.	Herb	A. Melo et al. 458
	Scleria mitis P.J.Bergius	Herb	A.C. Araújo et al. 1765
	Scleria secans (L.) Urb.	Herb	E. Pessoa and A. Melo 441
Dilleniaceae (Diogo Araújo)			
	Davilla angustifolia A. St.-Hil.	Woody climber	D. Araújo et al. 2438
	Davilla nitida (Vahl) Kubitzki	Woody climber	A. Melo et al. 703
	Davilla cf. *villosa* Eichler	Woody climber	B.S. Amorim et al. 937
Dioscoreaceae (Diogo Araújo)			
	Dioscorea aff. *altissima* Lam.	Herbaceous climber	B.S. Amorim et al. 1826 (sterile)
	Dioscorea aff. *cynanchifolia* Griseb.	Herbaceous climber	B.S. Amorim et al. 1770
	Dioscorea dodecaneura Vell.	Herbaceous climber	D. Araújo et al. 1768
	Dioscorea cf. *marginata* Griseb.	Herbaceous climber	B.S. Amorim et al. 1086 (sterile)
	Dioscorea orthogoneura Uline *ex* Hochr.	Herbaceous climber	B.S. Amorim et al. 1745 (sterile)
	Dioscorea piperifolia Humb. & Bonpl. *ex* Willd.	Herbaceous climber	A. Melo et al. 1209
	Dioscorea sinuata Vell.	Herbaceous climber	B.S. Amorim et al. 1742 (sterile)
	Dioscorea stegelmanniana R. Knuth	Herbaceous climber	D. Araújo et al. 1760
	Dioscorea trifida L.*f.*	Herbaceous climber	D.S. Correia et al. 89
Eleocarpaceae (Bruno S. Amorim)			
	Sloanea guianensis (Aubl.) Benth.	Tree	B.S. Amorim et al. 893
Eriocaulaceae (Aline Melo)			
	Paepalanthus myocephalus (Mart.) Körn.	Herb	J.L. Viana et al. 65
	Paepalanthus tortilis (Bong.) Mart.	Herb	A. Melo et al. 618
	Tonina fluviatilis Aubl.	Herb	A. Melo et al. 666
Erythroxylaceae (Iracema Loiola and James L. Costa-Lima)			
	Erythroxylum citrifolium A. St. Hill.	Tree	J.L. Costa-Lima et al. 875
	Erythroxylum mucronatum Benth.	Tree	J.L. Costa-Lima et al. 690
	Erythroxylum squamatum Sw.	Tree	A. Melo et al. 754
	Erythroxylum umbrosum Costa-Lima & M. Alves	Tree	A. Melo et al. 1206
	Erythroxylum vacciniifolium Mart.	Tree	J.L. Costa-Lima et al. 750
Euphorbiaceae (Maria F. Araújo and Bruno S. Amorim)			
	Aparisthmium cordatum (A. Juss.) Baill.	Tree	B.S. Amorim et al. 1758
	Astraea lobata (L.) Klotzsch	Herb	J.L. Viana et al. 329
	Cnidoscolus cf. *urens* (L.) Arthur	Herb	B.S. Amorim et al. 796
	Croton echioides Baill.	Shrub	D.S. Correia et al. 64
	Croton floribundus Spreng	Shrub	D.S. Correia et al. 138
	Croton tricolor Klotzsch *ex* Baill.	Shrub	B. S. Amorim et al. 910
	Croton triqueter Lam.	Subshrub	B.S. Amorim et al. 1283
	Dalechampia ficifolia Lam.	Woody climber	B.S. Amorim et al. 775
	Dalechampia pernambucensis Baill.	Woody climber	B.S. Amorim et al. 797
	Euphorbia comosa L.	Herb	B.S. Amorim et al. 963
	Euphorbia hyssopifolia L.	Herb	A. Melo et al. 613
	Euphorbia insulana Vell.	Herb	B.S. Amorim et al. 964
	Mabea piriri Aubl.	Tree	G.A. Gomes-Costa et al. 191
	Microstachys corniculata (Vahl) Griseb.	Subshrub	B.S. Amorim et al. 827
	Pausandra morisiana (Casar.) Radlk.	Tree	B.S. Amorim et al. 1273
	Romanoa tamnoides (A. Juss.) Radcl.-Sm.	Herbaceous climber	E. Pessoa et al. 443
	Sapium glandulosum (L.) Morong	Tree	A.M. Miranda and L. Félix 1602
	Senefeldera verticillata (Vell.) Croizat.	Tree	A. Melo et al. 700

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Table 1. *Continued.*

Family	Species	Habit	Voucher
Fabaceae (Rubens Queiroz, Maria T. Buril, Aline Melo, Diogo Araújo and Rosália C. Duarte)			
Caesalpinoideae			
	Bauhinia acreana Harms.	Tree	B.S. Amorim et al. 1780
	Bauhinia cf. forficata Link.	Tree	B.S. Amorim et al. 1279
	Cassia grandis L. *f.*	Tree	B.S. Amorim et al. 1301
	Chamaecrista desvauxii (Collad.) Killip.	Subshrub	J.A. Siqueira-Filho 964
	Chamaecrista duartei (H.S.Irwin) H.S. Irwin & Barneby	Tree	B.S. Amorim et al. 1752
	Chamaecrista duckeana (P. Bezerra & Afr. Fern.) H.S. Irwin & Barneby	Subshrub	D.S. Correia et al. 86
	Dialium guianense (Aubl.) Sandwith	Tree	D.S. Correia et al. 85
	Phanera outimouta (Aubl.) L.P. Queiroz	Woody climber	A. Melo et al. 688
	Senna aversiflora (Herb.) H.S. Irwin & Barneby	Shrub	M.T. Buril et al. 637
	Senna georgica H.S. Irwin & Barneby	Tree	A. Melo et al. 646
	Senna macranthera (DC. *ex* Collad.) H.S. Irwin & Barneby	Tree	B.S. Amorim et al. 1233
	Senna quinquangulata (Rich.) H.S. Irwin & Barneby	Tree	D.S. Correia et al. 131
Mimosoideae			
	Albizia pedicellaris (DC.) L. Rico	Tree	E. Pessoa and A. Melo 482
	Enterolobium contortisiliquum (Vell.) Morong	Tree	B.S. Amorim et al. 1300
	Inga edulis Mart	Tree	B.S. Amorim et al. 1066
	Inga marginata Will.	Tree	B.S. Amorim et al. 1270
	Inga striata Benth.	Tree	A. Melo et al. 585
	Inga thibaudiana DC.	Tree	B.S. Amorim et al. 1299
	Mimosa ceratonia L.	Tree	A. Melo et al. 605
	Mimosa pudica L.	Herb	A. Melo et al. 610
	Mimosa sensitiva L.	Subshrub	A. Melo et al. 609
	Parkia pendula (Willd.) Walp.	Tree	B.S. Amorim et al. 1843
	Stryphynodendron pulcherrimum (Willd.) Hochr.	Tree	D. Araújo et al. 1759
Papilonoideae			
	Aeschynomene cf. *elegans* Schltdl. & Cham.	Herb	A. Melo et al. 611
	Ancistrotropis peduncularis (Kunth) A. Delgado	Woody climber	J.A. Siqueira-Filho 818
	Andira fraxinifolia Benth	Tree	B.S. Amroim et al. 1750
	Bowdichia virgilioides Kunth	Tree	B.S. Amorim et al. 1247
	Calopognium caerulum (Benth.) C. Wright	Herbaceous climber	B.S. Amorim et al. 1244
	Canavalia brasiliensis Mart. *ex* Benth.	Subshrub	A. Melo et al. 570
	Canavalia dictyota Piper	Subshrub	A. Melo et al. 681
	Centrosema brasilianum (L.) Benth.	Herbaceous climber	D. Araújo et al. 1876
	Clitoria falcata Lam.	Woody climber	A. Melo et al. 647
	Crotalaria incana L.	Shrub	M.T. Buril et al. 631
	Crotalaria stipularia Desv.	Herb-Subshrub	J.L. Viana et al. 142
	Desmodium barbatum (L.) Benth.	Subshrub	D.S. Correia et al. 122
	Desmodium incanum (Sw.) DC.	Herb	B.S. Amorim et al. 1052
	Desmodium triflorum (L.) DC.	Herb	D. Cavalcanti et al. 683
	Desmodium cf. *uncinatum* (Jacq.) DC.	Herb	A. Melo et al. 681
	Dioclea glabra Benth	Woody climber	J.L. Viana et al. 416
	Dioclea violacea Mart. *ex* Benth.	Woody climber	B.S. Amorim et al. 1234
	Dioclea wilsonii Standl.	Woody climber	J.L. Viana et al. 501
	Machaerium hirtum (Vell.) Stellfeld	Tree	A. Melo et al. 699
	Machaerium salzmannii Benth.	Tree	D.S. Correia et al. 95
	Macroptilium bracteatum (Nees & C. Mart.) Maréchal & Baudet	Herbaceous climber	B.S. Amorim et al. 1304
	Mucuna urens (L.) Medik	Woody climber	D. Araújo et al. 1943
	Pterocarpus rohri Vahl.	Tree	B.S. Amorim et al. 1749
	Rhynchosia phaseoloides (Sw.) DC.	Woody climber	A. Melo et al. 694
	Vigna lasiocarpa (Mart.*ex* Benth.) Verdc.	Woody climber	D. Araújo et al. 1918
	Zornia latifolia Sm.	Herb	E. Pessoa et al. 497
Gentianaceae (Aline Melo)			
	Chelonanthus purpurascens (Aubl.) Struwe & V.A. Albert	Herb	A. Melo et al. 566
	Coutoubea spicata Aubl.	Subshrub	A. Melo et al. 633
	Voyria flavescens Griseb.	Herb	A. Melo et al. 469
	Voyria tenella Hook.	Herb	A. Melo et al. 462
Gesneriaceae (Aline Melo)			
	Codonanthopsis uleana (Fritsch) Chautems & Mat. Perret	Subshrub	J.L. Costa-Lima et al. 874
	Columnea sanguinea Rich & Juss. *ex* DC.	Herb	M.T. Buril et al. 624
	Drymonia coccinea (Aubl.) Wiehler	Subshrub	B.S. Amorim et al. 879
	Gloxinia perennis (L.) Fritsch	Herb	J.L. Costa-Lima et al. 731
	Nematanthus albus Chautems	Subshrub	J.A. Siqueira-Filho et al. 1097

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Table 1. *Continued.*

Family	Species	Habit	Voucher
	Paliavana tenuiflora Mansf.	Shrub	A. Melo et al. 445
	Sinningia nordestina Chautems, Baracho & J.A. Siqueira	Herb	A. Melo et al. 574
	Sinningia barbata (Nees & Mart.) G. Nicholson	Herb	J.A. Siqueira-Filho 930
Heliconiaceae (Aline Melo, Bruno S. Amorim and Edlley Pessoa)			
	Heliconia pendula Wawra	Herb	J.A. Siqueira-Filho 914
	Heliconia psittacorum L.*f.*	Herb	A. Melo et al. 596
	Heliconia spathocircinata Aristeg.	Herb	A. Melo et al. 698
Humiriaceae (Aline Melo)			
	Sacoglottis mattogrossensis Malme	Tree	S.O. Santos et al. 282
Hydrocharitaceae (Marccus Alves)			
	Apalanthe granatensis (Bonpl.) Planch.	Herb	M.L. Bazante et al. 109
Hydroleaceae (Suzana N. Moreira)			
	Hydrolea spinosa L.	Subshrub	B.S. Amorim et al. 1756
Hypericaceae (Bruno S. Amorim)			
	Vismia guianensis (Aubl.) Choisy	Tree	B.S. Amorim et al. 1243
Hypoxidaceae (Marccus Alves)			
	Hypoxis decumbens L.	Herb	A. Melo et al. 642
Iridaceae (Marccus Alves and Aline Melo)			
	Cipura paludosa Aubl.	Herb	J.L. Costa-Lima et al. 743
	Eleutherine bulbosa (Mill.) Urb.	Herb	J.L. Costa-Lima et al. 732
	Neomarica humilis (Klatt) Capell.	Herb	A. Melo et al. 1221
Lacistemataceae (Aline Melo)			
	Lacistema robustum Schnizl.	Tree	A. Melo et al. 751
Lamiaceae (Maria F. Agra)			
	Aegiphila cf. *racemosa* Vell.	Subshrub	E.D. Mendonça et al. 70
	Mesosphaerum pectinatum (L.) Kuntze	Herb - Subshrub	J.L. Viana et al. 70
	Hyptis sidifolium (L'Hérit.) Harley & J.F.B. Pastore	Herb	J.L. Viana et al. 205
Lauraceae (Suéllen O. Santos)			
	Aniba firmula (Nees & Mart.) Mez	Tree	D.S. Correia et al. 79
	Cinnamomum triplinerve (Ruiz & Pav.) Kosterm.	Tree	E.D. Mendonça et al. 52
	Nectandra cuspidata Nees	Tree	S.O. Santos et al. 290
	Ocotea glauca (Nees & Mart.) Mez	Tree	B.S. Amorim et al. 1278
	Ocotea glomerata (Nees) Mez	Tree	S.O. Santos et al. 168
	Ocotea longifolia Kunth	Tree	S.O. Santos et al. 170
	Ocotea puberula (Rich.) Nees	Tree	S.O. Santos et al. 169
Lecythidaceae (Bruno S. Amorim)			
	Eschweilera ovata (Cambess.) Mart. *ex* Miers	Tree	B.S. Amorim et al. 1260
	Lecythis lurida (Miers) S.A. Mori	Tree	J.A. Siqueira-Filho 1194
	Lecythis pisonis Cambess.	Tree	B.S. Amorim et al. 1775
Lentibulariaceae (Aline Melo)			
	Utricularia pusilla Vahl	Herb	A. Melo et al. 464
	Utricularia cf. *subulata* L.	Herb	J.L. Costa-Lima et al. 864
Linderniaceae (Jéssica L. Viana)			
	Lindernia dubia (L.) Pennell	Herb	J.L. Viana et al. 320
	Torenia thouarsii (Cham. & Schltdl.) Kuntze	Herb	J.L. Costa-Lima et al. 862
Loganiaceae (H. Alcantara and Bruno S. Amorim)			
	Spigelia flemmingiana Cham. & Schltdl.	Subshrub	E. Pessoa et al. 518
	Strychnos atlantica Krukoff & Barneby	Woody climber	B.S. Amorim et al. 895
Loranthaceae (Bruno S. Amorim)			
	Passovia pyrifolia (Kunth) Tiegh.	Shrub	A. Melo et al. 696
	Struthanthus cf. *concinnus* (Mart.) Mart.	Shrub	B.S. Amorim et al. 1089
Lythraceae (Jéssica L. Viana)			
	Cuphea campestris Koehne	Subshrub	A. Melo et al. 567
	Cuphea carthagenensis (Jacq.) J. Macbr.	Subshrub	B.S. Amorim et al. 905
	Cuphea micrantha Kunth	Subshrub	J.L. Viana et al. 200
	Cuphea racemosa (L. *f.*) Spreng.	Subshrub	A. Melo et al. 590
Malpighiaceae (André Amorim)			
	Banisteriopsis muricata (Cav.) Cuatrec.	Woody climber	D. Araújo et al. 1914
	Byrsonima sericea DC.	Tree	A. Melo et al. 650
	Byrsonima stipulacea A. Juss.	Shrub	B.S. Amorim et al. 914
	Heteropterys cordifolia Moric. *ex* A. Juss	Woody climber	G.A. Gomes-Costa et al. 186
	Heteropterys nordestina Amorim	Woody climber	B.S. Amorim et al. 951
	Stigmaphyllon blanchetii C.E. Anderson	Woody climber	S.O. Santos et al. 272
	Tetrapterys phlonoides (Spreng.) Nied.	Woody climber	B.S. Amorim et al. 1753

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Table 1. *Continued.*

Family	Species	Habit	Voucher
Malvaceae (Bruno S. Amorim)			
	Apeiba tibourbou Aubl.	Tree	B.S. Amorim et al. 909
	Eriotheca macrophylla (K. Schum.) A. Robins	Tree	B.S. Amorim et al. 880
	Gossypium barbadense L.*	Shrub	B.S. Amorim et al. 765
	Helicteres ovata Lam.	Shrub-Tree	A. Viana et al. 486
	Luehea paniculata Mart. & Zucc.	Shrub	B.S. Amorim et al. 908
	Pachira aquatica Aubl.	Tree	B.S. Amorim et al. 1751
	Pavonia malacophylla (Link & Otto) Garcke	Shrub	M.A. Chagas et al. 3
	Quararibea turbinata (Sw.) Poir.	Tree	A. Viana 508
	Sida glomerata Cav.	Subshrub	B.S. Amorim et al. 924
	Sida linifolia Cav.	Subshrub	B.S. Amorim et al. 776
	Sida rhombifolia L.	Subshrub	B.S. Amorim et al. 923
	Sida spinosa L.	Subshrub	B.S. Amorim et al. 790
	Sida urens L.	Subshrub	A. Melo et al. 604
	Sidastrum paniculatum (L.) Fryxell	Subshrub	B.S. Amorim et al. 1240
	Triumfetta althaeoides Lam.	Shrub	A. Melo et al. 542
	Waltheria indica L.	Subshrub	B.S. Amorim et al. 1743
	Wissadula amplissima (L.) R.E. Fr.	Subshrub	B.S. Amorim et al. 1294
Marantaceae (Edlley Pessoa, Jéssica L. Viana and Katarina Pinheiro)			
	Ctenanthe casupoides Petersen	Herb	J.L. Viana et al. 264
	Ctenanthe compressa (A. Dietr.) Eichler	Herb	D. Araújo et al. 2396
	Ctenanthe glabra (Körn.) Eichler	Herb	J.L. Viana et al. 104
	Goeppertia sellowii (Körn.) Borchs. & S. Suárez	Herb	D.S. Correia et al. 72
	Goeppertia umbrosa (Körn.) Borchs. & S.Suárez	Herb	E. Pessoa et al. 492
	Ichnosiphon gracilis (Rudge) Körn.	Herb	D. Araújo et al 2391
	Maranta aff. anderssoniana Yosh.-Arns et al.	Herb	N.K. Luna et al. 127
	Maranta cristata Nees & Mart.	Herb	E.D. Mendonça et al 69
	Maranta divaricata Roscoe	Herb	E. Pessoa and A. Melo 456
	Maranta noctiflora Regel & Körn.	Herb	A. Melo et al. 777
	Monotagma plurispicatum (Körn.) K.Schum.	Herb	A. Melo et al. 645
	Stromanthe tonckat (Aubl.) Eichler	Herb	B.S. Amorim et al. 935
Marcgraviaceae (Bruno S. Amorim)			
	Souroubea guianensis Aubl.	Woody climber	B.S. Amorim et al. 1292
Mayacaceae (James L. Costa-Lima)			
	Mayaca fluviatilis Aubl.	Herb	J.L. Costa-Lima et al. 861
Melastomataceae (Earl Chagas, Cínthia M.L. Araújo and Aline Melo)			
	Aciotis rubricaulis (Mart. *ex* DC.) Triana	Herb	A. Melo et al. 649
	Acisanthera hedyotidea (K. Presl) Triana	Herb	G.A. Gomes-Costa et al. 222
	Bertolonia marmorata (Naudin) Naudin	Herb	E. Pessoa et al. 524
	Clidemia capitellata (Bonpl.) D. Don	Shrub	S.O. Santos et al. 176
	Clidemia debilis Crueg.	Shrub	J.B.S. Oliveira et al. 221
	Clidemia hirta (L.) D. Don	Shrub	A. Melo et al. 577
	Clidemia urceolata DC.	Shrub	A. Melo et al. 624
	Henriettea succosa (Aubl.) DC.	Tree	A. Melo et al. 773
	Huberia consimilis Baumgratz	Tree	A. Melo et al. 668
	Leandra rufescens (DC.) Cogn.	Shrub	A. Melo et al. 594
	Miconia affinis DC.	Shrub-Tree	E.C.O. Chagas Mota 10275
	Miconia albicans (Sw.) Steud.	Shrub-Tree	E.C.O. Chagas Mota 8411
	Miconia calvescens DC.	Tree	S.O. Santos et al. 190
	Miconia caudigera DC.	Shrub-Tree	E.C.O. Chagas Mota 8357
	Miconia ciliata (Rich.) DC.	Shrub	E.C.O. Chagas Mota 8465
	Miconia dodecandra Cogn.	Shrub-Tree	J.B.S. Oliveira et al. 222
	Miconia hypoleuca (Benth.) Triana	Tree	M.A. Chagas et al. 08
	Miconia lepidota DC.	Tree	A. Melo et al. 774
	Miconia minutiflora (Bonpl.) DC.	Shrub	S.O. Santos et al. 191
	Miconia mirabilis (Aubl.) L.O. Williams	Tree	A. Melo et al. 575
	Miconia nordestina R. Goldenb. & E. Chagas	Shrub-Tree	E. Chagas-Mota 10276
	Miconia nervosa (Sm.) Triana	Shrub	A. Melo et al. 448
	Miconia prasina (Sw.) DC.	Shrub-Tree	M.R. Barbosa 3325
	Miconia pusilliflora (DC.) Naudin	Shrub-Tree	J.L. Viana et al. 343
	Pterolepis glomerata (Rottb.) Miq.	Subshrub	A. Melo et al. 653
	Pterolepis polygonoides Triana	Subshrub	J.A. Siqueira-Filho 1114
	Pterolepis trichotoma (Rotb.) Cogn.	Herb	J.L. Viana et al. 324
	Tibouchina fissinervia Cogn.	Tree	A. Melo et al. 449
	Tibouchina heteromalla (D. Don) Cogn.	Shrub	A. Melo et al. 591

Continued

Table 1. *Continued.*

Family	Species	Habit	Voucher
Meliaceae (Bruno S. Amorim)			
	Guarea macrophylla Vahl	Tree	B.S. Amorim et al. 1082
Menispermaceae (Bruno S. Amorim)			
	Cissampelos andromorpha DC.	Woody climber	G.A. Gomes-Costa et al. 200
	Hyperbaena domingensis (DC.) Benth	Woody climber	B.S. Amorim et al. 788
	Orthomene schomburgkii (Miers) Barneby & Krukoff	Woody climber	B.S. Amorim et al. 1582
Menyanthaceae (Diogo Araújo)			
	Nymphoides indica (L.) Kuntze	Herb	B.S. Amorim et al. 1093
Monimiaceae (Diogo Araújo)			
	Mollinedia ovata Ruiz & Pav.	Tree	A. Melo et al. 753
Moraceae (Aline Melo and Bruno S. Amorim)			
	Dorstenia bahiensis Klotzsch *ex* Fisch. & C.A.Mey.	Herb	A. Melo et al. 702
	Ficus cf. calyptroceras (Miq.) Miq.	Tree	D. Araújo et al. 1783
	Helicostylis tomentosa (Poepp. & Endl.) Rusby	Tree	B.S. Amorim et al. 1847
Myristicaceae (Bruno S. Amorim)			
	Virola gardneri (A.DC.) Warb	Tree	A. Melo et al. 755
Myrtaceae (Bruno S. Amorim)			
	Campomanesia aromatica (Aubl.) Griseb.	Tree	B.S. Amorim et al. 1567
	Campomanesia dichotoma (O. Berg) Mattos	Tree	E. Pessoa et al. 444
	Campomanesia xanthocarpa (Mart.) Berg.	Tree	B.S. Amorim et al. 1857
	Eugenia astringens Cambess.	Shrub	B.S. Amorim et al. 1988
	Eugenia cf. *candolleana* DC.	Tree	B.S. Amorim et al. 1280 (sterile)
	Eugenia culicina Sobral	Tree	B.S. Amorim et al. 1782
	Eugenia excelsa O. Berg	Tree	B.S. Amorim et al. 800
	Eugenia ligustrina (Sw.) Willd.	Tree	B.S. Amorim et al. 1840
	Eugenia pyriformis Cambess.	Tree	B.S. Amorim et al. 1851
	Eugenia submontana B.S. Amorim & M. Alves	Tree	B.S Amorim et al. 1080
	Eugenia tumescens B.S. Amorim & M. Alves	Tree	B.S. Amorim et al. 1783
	Eugenia umbrosa O. Berg	Tree	B.S. Amorim et al. 1757
	Myrcia amplexicaulis (Vell.) Hook. *f.*	Tree	B.S. Amorim et al. 817
	Myrcia spectabilis DC.	Tree	B.S. Amorim et al. 768
	Myrcia splendens (Sw.) DC.	Tree	B.S. Amorim et al. 1781
	Myrcia sylvatica (G. Mey) DC.	Tree	A. Melo et al. 685
	Myrcia tenuivenosa Kiaersk.	Tree	B.S. Amorim et al. 945
	Myrcia tomentosa (Aubl.) DC.	Tree	B.S. Amorim et al. 771
	Psidium guajava L.	Tree	B.S. Amorim et al. 1250
	Psidium guineense Sw.	Tree	B.S. Amorim et al. 770
	Syzygium cumini (L.) Skeels*	Tree	B.S. Amorim et al. 815
Nyctaginaceae (Aline Melo)			
	Guapira opposita (Vell.) Reitz	Tree	A. Melo et al. 756
Ochnaceae (Fernanda Silva)			
	Ouratea crassa Tiegh.	Tree	B.S. Amorim et al. 793
	Sauvagesia erecta L.	Subshrub	A. Melo et al. 607
Olacaceae (Bruno S. Amorim)			
	Cathedra rubricaulis Miers	Shrub-Tree	B.S. Amorim et al. 792
Onagraceae (Bruno S. Amorim)			
	Ludwigia hyssopifolia (G. Don) Exell	Herb	E. Pessoa et al. 471
Orchidaceae (Edlley Pessoa)			
	Acianthera glumacea (Lindl.) Pridgeon & M.W. Chase	Herb	E. Pessoa et al. 520
	Acianthera hygrophila (Barb. Rodr.) Pridgeon & M.W. Chase	Herb	E. Pessoa et al. 954
	Anathallis barbulata (Lindl.) Pridgeon & M.W. Chase	Herb	E. Pessoa et al. 521
	Anathallis sclerophylla (Lindl.) Prodgeon & M.W. Chase	Herb	E. Pessoa et al. 959
	Aspidogyne argentea (Vell.) Garay	Herb	E. Pessoa et al. 427
	Aspidogyne foliosa (Poepp. Endl.) Garay	Herb	E. Pessoa et al. 416
	Brassavola tuberculata Hook.	Herb	J.A. Siqueira-Filho 985
	Camaridium carinatum (Barb. Rodr.) Hoehne	Herb	E. Pessoa et al. 931
	Camaridium micranthum M.A. Blanco	Herb	E. Pessoa et al. 928
	Campylocentrum crassirhizum Hoehne	Herb	E. Pessoa and A. Melo 470
	Campylocentrum micranthum (Lindl.) Rolfe	Herb	E. Pessoa et al. 1062
	Campylocentrum pernambucense Hoehne	Herb	E. Pessoa and A. Melo 429
	Campylocentrum robustum Cogn.	Herb	M.T. Buril et al. 645
	Campylocentrum serranum E. Pessoa & M. Alves	Herb	E. Pessoa et al. 1051
	Cattleya granulosa Lindl.	Herb	E. Pessoa et al. 941

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Table 1. *Continued.*

Family	Species	Habit	Voucher
	Cattleya labiata Lindl.	Herb	E. Pessoa et al. 500
	Comparettia barkeri (Lindl.) M.W. Chase & N.H. Williams	Herb	E. Pessoa and A. Melo 450
	Cyrtopodium flavum Link & Otto *ex* Rchb.	Herb	E. Pessoa and A. Melo 434
	Dichaea panamensis Lindl.	Herb	E. Pessoa and A. Melo 419
	Dichaea pendula (Aubl.) Cogn.	Herb	E. Pessoa et al. 958
	Dimerandra emarginata (G. Mey.) Hoehne	Herb	E. Pessoa and A. Melo 460
	Elleanthus linifolius C. Presl.	Herb	J.A. Siqueira-Filho 1015
	Encyclia oncidioides (Lindl.) Schltr.	Herb	E. Pessoa et al. 1291
	Epidendrum anatipedium L.M. Sánchez & Hágsater	Herb	E. Pessoa et al. 935
	Epidendrum campaccii Hágsater & L. Sánchez	Herb	E. Pessoa et al. 937
	Epidendrum carpophorum Barb. Rodr.	Herb	E. Pessoa et al. 1048
	Epidendrum cinnabarinum Salzm. *ex* Lindl.	Herb	E. Pessoa and A. Melo 436
	Epidendrum macrocarpum Rich.	Herb	A. Melo et al. 588
	Epidendrum proligerum Barb. Rodr.	Herb	J.G. Gomes s.n. (UFP 6889)
	Epidendrum ramosum Jacq.	Herb	E. Pessoa and A. Melo 414
	Epidendrum rigidum Jacq.	Herb	E. Pessoa and A. Melo 417
	Epidendrum strobiliferum Rchb. *f.*	Herb	E. Pessoa and A. Melo 420
	Epidendrum sanchezii E. Pessoa & L. P. Félix	Herb	E. Pessoa et al. 1056
	Epidendrum tridactylum Lindl.	Herb	E. Pessoa et al. 951
	Eurystyles cotyledon Wawra	Herb	E. Pessoa et al. 955
	Gomesa barbata (Lindl.) M.W. Chase & N.H.Williams	Herb	E. Pessoa and A. Melo 415
	Gomesa loefgrenii (Cogn.) M.W. Chase & N.H.Williams	Herb	J.A. Siqueira-Filho 1180
	Gongora vitorinoana Chiron & L.C. Menezes	Herb	E. Pessoa et al. 1040
	Habenaria crytophila Barb. Rodr.	Herb	A. Melo et al. 1197
	Habenaria petalodes Lindl.	Herb	M.A.Chagas et al. 19
	Habenaria pratensis (Lindl.) Rchb. *f.*	Herb	M.A.Chagas et al. 20
	Habenaria trifida Kunth.	Herb	J.L. Viana et al. 295
	Heterotaxis discolor (Lodd. *ex* Lindl.) Ojeda & Carnevali	Herb	E. Pessoa et al. 926
	Isochilus linearis (Jacq.) R. Br.	Herb	E. Pessoa et al. 538
	Jacquiniella globosa (Jacq.) Schltr.	Herb	E. Pessoa and A. Melo 423
	Jacquiniella teretifolia (Sw.) Britton & Wilson	Herb	E. Pessoa et al. 1053
	Lepanthopsis floripecten (Rchb. *f.*) Ames	Herb	E. Pessoa et al. 1049
	Liparis nervosa (Thumb.) Lindl.	Herb	J.A. Siqueira-Filho 1085
	Malaxis excavata (Lindl.) Kuntze	Herb	J.L. Viana et al. 307
	Mapinguari desvauxianus (Rchb. *f.*) Carnevali & R.B. Singer	Herb	E. Pessoa et al. 930
	Maxillaria leucaimata Barb. Rodr.	Herb	E. Pessoa et al. 1054
	Maxillaria ochroleuca Lodd. *ex* Lindl.	Herb	E. Pessoa et al. 927
	Mesadenella cuspidata (Lindl.) Garay	Herb	E. Pessoa et al. 957
	Mormolyca rufescens (Lindl.) M.A. Blanco	Herb	E. Pessoa et al. 547
	Myoxanthus exasperatus (Lindl.) Luer	Herb	E. Pessoa et al. 1042
	Nitidobulbon nasutum (Rchb. f.) I. Ojeda & Carnevali	Herb	J.A. Siqueira-Filho 984
	Notylia inversa Barb. Rodr.	Herb	E. Pessoa and A. Melo 480
	Octomeria alexandri Schltr.	Herb	E. Pessoa et al. 1065
	Oeceoclades maculata (Lindl.) Lindl.	Herb	G.A. Gomes-Costa et al. 194
	Pabstiella lingua (Lindl.) Luer	Herb	E. Pessoa et al. 943
	Phragmipedium sargentianum Rolfe	Herb	E. Pessoa and A. Melo 435
	Pleurothallis pruinosa Lindl.	Herb	E. Pessoa et al. 546
	Pleurothallis ruscifolia (Jacq.) R. Br.	Herb	E. Pessoa et al. 1057
	Polystachya estrellensis Rchb. *f.*	Herb	E. Pessoa and A. Melo 418
	Prescottia oligantha (Sw.) Lindl.	Herb	E. Pessoa and A. Melo 433
	Prescottia plantaginifolia Lindl. *ex* Hook.	Herb	J.A. Siqueira-Filho 1176
	Prosthechea alagoensis (Pabst) W.E. Higgins	Herb	E. Pessoa et al. 504
	Prosthechea pygmaea (Hook.) W.E. Higgins	Herb	E. Pessoa and A. Melo 425
	Prosthechea vespa (Vell.) W.E. Higgins	Herb	B.S. Amorim et al. 1087
	Psilochilus modestus Barb. Ro	Herb	J.L. Viana et al. 121
	Rhetinantha notylioglossa (Rchb. *f.*) M.A. Blanco	Herb	E. Pessoa et al. 525
	Rodriguezia bahiensis Rchb. *f.*	Herb	E. Pessoa et al. 508
	Sacoila lanceolata (Aubl.) Garay	Herb	E. Pessoa et al. 1041
	Scaphyglottis fusiformis (Griseb.) Schultes	Herb	E. Pessoa and A. Melo 422
	Scaphyglottis modesta (Rchb. *f.*) Schltr.	Herb	E. Pessoa and A. Melo 481
	Scaphyglottis sickii Pabst	Herb	E. Pessoa et al. 517
	Sobralia liliastrum Salzm. *ex* Lindl.	Herb	E. Pessoa and A. Melo 432
	Specklinia integripetala E. Pessoa & F. Barros	Herb	E. Pessoa and A. Melo 428
	Stelis aprica Lindl.	Herb	E. Pessoa et al. 545

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Table 1. *Continued.*

Family	Species	Habit	Voucher
	Stelis deregularis Barb. Rodr.	Herb	B.S. Amorim et al. 1126
	Stelis loefgrenii Cogn.	Herb	E. Pessoa et al. 548
	Trichocentrum fuscum Lindl.	Herb	E. Pessoa et al. 956
	Vanilla cf. *mexicana* Mill.	Herb	E. Pessoa et al. 1060
	Vanilla pompona Schiede	Herb	E. Pessoa et al. 499
	Zygostates bradei (Schltr.) Garay	Herb	E. Pessoa and A. Melo 431
	Wullschlaegelia aphylla (Sw.) Rchb. *f.*	Herb	E. Pessoa et al. 1285
Orobanchaceae (Bruno S. Amorim)			
	Melasma melampyroides (Rich.) Pennell	Subshrub	J.L. Viana et al. 73
Oxalidaceae (James L. Costa-Lima)			
	Oxalis corniculata L.	Herb	J.L. Costa-Lima et al. 706
	Oxalis cratensis Oliv. *ex* Hook.	Herb	D. Araújo et al. 1940
	Oxalis umbraticola A. St. Hill	Herb	D.S. Correia et al. 76
Passifloraceae (Diogo Araújo)			
	Passiflora capsularis L.	Woody climber	D. Araújo et al. 1941
	Passiflora circinnata Mast.	Woody climber	D. Araújo et al. 16
	Passiflora contracta Vitta	Woody climber	D. Araújo et al. 1762
	Passiflora edulis Sims	Woody climber	B.S. Amorim et al. 1734
	Passiflora foetida L.	Woody climber	G.A. Gomes-Costa et al. 217
	Passiflora mansoi (Mart.) Mast.	Woody climber	B.S. Amorim et al. 955
	Passiflora misera Kunth	Woody climber	D. Araújo et al. 1772
	Passiflora rubra L.	Woody climber	J.A. Siqueira-Filho 787/711 (UFP 21406)
	Passiflora silvestris Vell.	Woody climber	S.O. Santos et al. 187
	Passiflora suberosa L.	Woody climber	D. Araújo et al. 1718
	Passiflora watsoniana Mast	Woody climber	B.S. Amorim et al. 791
Peraceae (Marccus Alves)			
	Chaetocarpus myrsinites Baill.	Tree	B.S. Amorim et al. 1079
Phyllanthaceae (Bruno S. Amorim)			
	Hieronyma oblonga (Tul.) Müll. Arg.	Tree	B.S. Amorim et al. 1748
	Phyllanthus gradyi M.S. Silva & M.F. Sales	Tree	A. Melo et al. 772
Phytolaccaceae (Aline Melo)			
	Phytolacca thyrsiflora Fenzl *ex* J.A. Schmidt	Herb	S.O. Santos et al. 306
Picramniaceae (Katarina Pinheiro)			
	Picramnia gardneri Planch.	Shrub	A. Melo et al. 454
Piperaceae (Aline Melo and Daniele Monteiro)			
	Peperomia cf. *elongata* Kunth.	Herb	D. Araújo et al. 2420
	Peperomia glabella (Sw.) Dietr.	Herb	A. Melo et al. 766
	Peperomia increscens Miq.**	Herb	J.L. Costa-Lima et al. 701
	Peperomia magnoliifolia (Jacq.) A. Dietr.	Herb	A. Melo et al. 752
	Peperomia obtusifolia (L.) A. Dietr.	Herb	J.L. Costa-Lima et al. 876
	Peperomia pseudoestrellensis C. DC.	Herb	D. Araújo et al. 1750
	Peperomia rotundifolia (L.) Kunth	Herb	A. Melo et al. 764
	Piper amplum Kunth	Shrub	A. Melo et al. 782
	Piper anisum (Spreng.) Angely	Shrub	B.S. Amorim et al. 1059
	Piper arboreum Aubl.	Shrub	B.S. Amorim et al. 1253
	Piper caldense C. DC.	Shrub	A. Melo et al. 592
	Piper cernuum Vell.	Shrub	A. Melo et al. 672
	Piper hispidum Sw.	Shrub	A. Melo et al. 579
	Piper limai Yuck.	Shrub	A. Melo et al. 686
	Piper marginatum Jacq.	Shrub	A. Melo et al. 580
	Piper mollicomum Kunth	Shrub	A. Melo et al. 778
	Piper umbellatum L.	Herb	B.S. Amorim et al. 1246
Plantaginaceae (Jéssica L. Viana and Bruno S. Amorim)			
	Achetaria scutellarioides (Benth.) Wettst.	Herb-Shrub	J.L. Viana et al. 162
	Angelonia biflora Benth	Herb-Subshrub	J.L. Viana et al. 281
	Angelonia salicariifolia Bonpl.	Herb-Subshrub	A. Melo et al. 634
	Bacopa stricta (Schrad.) Wettst. *ex* Edwall	Herb	J.L. Viana et al. 290
	Stemodia foliosa Benth	Herb-Shrub	J.L. Viana et al. 204
	Stemodia verticillata (Mill.) Hassl	Herb	J.L. Viana et al. 321
Poaceae (Jefferson R. Maciel)			
	Andropogon bicornis L.	Herb	J.L. Viana et al. 332
	Andropogon cf. *leucostachyus* Kunth	Herb	D. Araújo et al. 2380
	Axonopus capillaris (Lam.) Chase	Herb	J.R. Maciel et al. 1917
	Cenchrus purpureus (Schumach.) Morrone	Herb	G.A. Gomes-Costa et al. 212

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Table 1. *Continued.*

Family	Species	Habit	Voucher
	Chusquea cf. *capituliflora* Trin.	Herb	B.S. Amorim et al. 1584
	Chusquea aff. *urelytra* Hack	Herb	D. Araújo et al. 1767
	Dichanthelium assurgens (Renvoize) Zuloaga	Herb	J.L. Viana et al. 255
	Dichanthelium sciurotis (Trin.) Davidse	Herb	A. Melo et al. 583
	Digitaria fuscescens (J. Presl) Henrard	Herb	B.S. Amorim et al. 1076
	Digitaria tenuis (Nees) Henrard	Herb	J.R. Maciel et al. 1922
	Enteropogon mollis (Nees) Clayton	Herb	J.R. Maciel et al. 1921
	Eragrostis maypurensis (Kunth) Steud.	Herb	J.R. Maciel et al. 1920
	Eragrostis cf. *rufescens* Schrad. *ex* Schult.	Herb	D. Araújo et al. 1723
	Ichnanthus calvescens Nees	Herb	J.L. Viana et al. 135
	Ichnanthus dasycoleus Tutin	Herb	B.S. Amorim et al. 1064
	Ichnanthus leiocarpus (Spreng.) Kunth	Herb	B.S. Amorim et al. 820
	Ichnanthus grandiflorius (Döll) Zuloaga & Soderstr.	Herb	J.R. Maciel et al. 1906
	Ichnanthus nemoralis (Schrad. *ex* Schult.) Hitchc. & Chase	Herb	J.L. Viana et al. 262
	Ichnanthus tenuis (J. Presl & C. Presl) Hitchc. & Chase	Herb	B.S. Amorim et al. 1075
	Imperata brasiliensis Trin.	Herb	D. Araújo et al. 2441
	Lasiacis divaricata (L.) Hitchc.	Herb	B.S. Amorim et al. 1049
	Lasiacis sorghoidea (Desv. *ex* Ham.) Hitchc. & Chase	Herb	J.L. Viana et al. 106
	Merostachys neesii Rupr.	Herb	J.R. Maciel et al. 1928
	Olyra latifolia L.	Herb	E. Pessoa and A. Melo 455
	Oplismenus hirtellus (L.) P.Beauv.	Herb	E. Pessoa and A. Melo 453
	Parodiolyra micrantha (Kunth) Davidse & Zuloaga	Herb	B.S. Amorim et al. 1072
	Paspalum arenarium Schrad	Herb	J.R. Maciel et al. 1923
	Paspalum convexum Humb. & Bonpl. *ex* Fluggé	Herb	J.R. Maciel et al. 1919
	Paspalum maritimum Trin.	Herb	J.R. Maciel et al. 1924
	Paspalum nutans Lam.	Herb	J.R. Maciel et al. 1930
	Paspalum paniculatum L.	Herb	D. Araújo et al. 1917
	Pharus parvifolius Nash	Herb	J.R. Maciel et al. 1907
	Rugoloa pilosa (Sw.) Zuloaga	Herb	B.S. Amorim et al. 821
	Setaria sulcata Raddi	Herb	B.S. Amorim et al. 933
	Setaria vulpiseta (Lam.) Roem. & Schult.	Herb	J.L. Viana et al. 279
	Sporobolus monandrus Roseng., B.R. Arrill. & Izag.	Herb	J.R. Maciel et al. 1918
	Steinchisma laxum (Sw.) Zuloaga	Herb	D. Araújo et al. 2369
	Streptochaeta spicata Schrad *ex* Nees	Herb	J.L. Viana et al. 341
	Trichanthecium parvifolium (Lam.) Zuloaga & Morrone	Herb	D. Araújo et al. 2373
	Urochloa plantaginea (Link) R.D. Webster	Herb	B.S. Amorim et al. 826
Polygalaceae (Débora Cavalcanti)			
	Asemeia violacea (Aubl.) J.F.B. Pastore & J.R. Abbott	Herb	B.S. Amorim et al. 1599
	Polygala paniculata L.	Herb	A. Melo et al. 444
Polygonaceae (Juan García-Gonzáles and Bruno S. Amorim)			
	Coccoloba parimensis Benth.	Woody climber	B.S. Amorim et al. 813
	Coccoloba striata Benth.	Woody climber	B.S. Amorim et al. 941
Portulacaceae (Bruno S. Amorim)			
	Portulaca hirsutissima Cambess.	Herb	A. Melo et al. 746
	Talinum paniculatum (Jacq.) Gaertn.	Herb	A. Viana 521
Primulaceae (Katarina Pinheiro and Aline Melo)			
	Lysimachia ovalis (Ruiz & Pav.) U. Manns & Anderb.	Herb	D. Araújo et al. 1724
	Myrsine guianensis (Aubl.) Kuntze	Tree	D. Araújo et al. 1894
	Myrsine cf. umbellata Mart.	Tree	M. Chagas et al. 26
Proteaceae (Bruno S. Amorim)			
	Roupala montana Aubl.	Tree	B.S. Amorim et al. 1276
Quiinaceae (Marccus Alves)			
	Quiina cruegeriana Griseb.	Tree	D. Araújo et al. 2443
Ranunculaceae (Jéssica L. Viana)			
	Clematis dioica L.	Woody climber	J.L. Viana et al. 189
Rhamnaceae (Diogo Araújo)			
	Gouania blanchetiana Miq.	Woody climber	D. Araújo et al. 1929
Rosaceae (James L. Costa-Lima)			
	Rubus brasiliensis Mart.	Shrub	J.L. Costa-Lima 744
Rubiaceae (Jomar Jardim, Maria C. Pessoa and Maria S. Pereira)			
	Amaioua intermedia Mart. *ex* Schult. & Schult. f.	Shrub	J.L. Costa-Lima et al. 729
	Borreria decipiens K. Schum.	Subshrub	M.A. Chagas et al. 22
	Borreria humifusa Mart.	Herb	G.A. Gomes-Costa et al. 185
	Borreria latifolia (Aubl.) K. Schum.	Herb-Subshrub	J.L. Viana et al. 317

Continued

Table 1. *Continued.*

Family	Species	Habit	Voucher
	Borreria ocymifolia (Roem. & Schult.) Bacigalupo & E.L. Cabral	Herb	B.S. Amorim et al. 897
	Borreria scabiosoides Cham. & Schtdl.	Herb-Subshrub	J.L. Viana et al. 308
	Borreria verticillata (L.) G. Mey.	Subshrub	G.A. Gomes-Costa et al. 209
	Chiococca alba (L.) Hitchc	Shrub	A. Melo et al. 1200
	Chomelia pedunculosa Benth.	Shrub	B.S. Amorim et al. 1269
	Coccocypselum cordifolium Nees & Mart.	Herb	A. Melo et al. 1222
	Coccocypselum lanceolatum (Ruiz & Pav.) Pers.	Herb	A. Melo et al. 704
	Coussarea nodosa (Benth.) Müll. Arg.	Shrub	D.S. Correia et al. 91
	Coutarea hexandra (Jacq.) K. Schum.	Shrub	A. Melo et al. 635
	Emmeorhiza umbellata (Spreng.) K. Schum.	Herbaceous climber	D. Araújo et al. 1781
	Faramea multiflora A. Rich	Shrub	B.S. Amorim et al. 929
	Geophila repens (L.) I.M. Johnst.	Herb	J.L. Viana et al. 261
	Gonzalagunia dicocca Cham. & Schltdl.	Shrub	B.S. Amorim et al. 1077
	Guettarda viburnoides Cham. & Schltdl.	Tree	M. Chagas et al. 02
	Margaritopsis cephalantha (Müll.Arg.) C.M. Taylor	Shrub	M.T. Buril et al. 641
	Palicourea blanchetiana Schltdl.	Shrub	D.S. Correia et al. 93
	Palicourea marcgravii A. St-Hil	Shrub	A. Melo et al. 581
	Posoqueria cf. *acutifolia* Mart.	Shrub	A. Melo et al. 1132
	Posoqueria longiflora Aubl.	Shrub	D.S. Correia et al. 90
	Psychotria bahiensis DC.	Shrub	S.O. Santos et al. 181
	Psychotria bracteocardia (DC.) Mull. Arg.	Shrub	E. Pessoa and A. Melo 463
	Psychotria capitata Ruiz & Pav.	Shrub	W.W. Thomas 15292
	Psychotria carthagenensis Jacq.	Shrub	J.B.S. Oliveira 63
	Psychotria cupularis (Müll. Arg.) Standl.	Shrub	A. Viana & J.B.S. Oliveira 97
	Psychotria deflexa DC.	Shrub	S.O. Santos et al. 297
	Psychotria hoffmannseggiana (Willd. *ex* Schult.) Müll. Arg.	Shrub	E. Pessoa et al. 513
	Psychotria aff. *leiocarpa* Cham. & Schltdl	Shrub	B.S. Amorim et al. 896
	Psychotria platypoda DC.	Shrub	B.S. Amorim et al. 892
	Psychotria racemosa Rich.	Shrub	B.S. Amorim et al. 883
	Psychotria schlechtendaliana (Müll. Arg.) Müll. Arg.	Shrub	D.S. Correia et al. 109
	Psychotria vellosiana Benth.	Shrub	D. Araújo et al. 1752
	Ronabea latifolia Aubl.	Shrub	E. Pessoa and A. Melo 430
	Sabicea grisea Cham. & Schltdl	Shrub	D. Araújo et al. 1910
	Staelia virgata (Link *ex* Roem. & Schult.) K. Schum.	Herb	J.L. Costa Lima et al. 852
Rutaceae (Bruno S. Amorim and Aline Melo)			
	Conchocarpus cf. *heterophyllus* (A. St.-Hil.) Kallunki & Pirani	Tree	B.S. Amorim et al. 878
	Conchocarpus longifolius (A. St.-Hil.) Kallunki & Pirani	Tree	D.S. Correia et al. 107
	Hortia brasiliana Vand. *ex* DC.	Tree	A. Melo et al. 705
	Zantoxylum rhoifolium Lam.	Tree	A. Melo et al. 1192
Salicaceae (Aline Melo)			
	Casearia javitensis H.B.K.	Tree	B.S. Amorim 1754
	Casearia sylvestris Sw.	Tree	A. Melo et al. 697
	Xylosma ciliatifolia (Clos) Eichler	Tree	T. Leão 906
Santalaceae (Bruno S. Amorim)			
	Phoradendron cf. *crassifolium* (Pohl *ex* DC.) Eichler	Shrub	A. Melo et al. 695
	Phoradendron mucronatum (DC.) Krug & Urb.	Shrub	M.L. Bazante et al. 87
Sapindaceae (Luiz A. Pereira, Diogo Araújo and Bruno S. Amorim)			
	Allophylus puberulus (Cambess.) Radlk.	Tree	M.A. Chagas et al. 13
	Allophylus racemosus Sw.	Tree	D.S. Correia et al. 67
	Cupania impressinervia Acerv.-Ro	Tree	A. Melo et al. 692
	Cupania racemosa (Vell.) Radlk.	Tree	B.S. Amorim et al. 1242
	Dilodendron bipinatum Radlk.	Tree	J.A. Siquira-Filho et al. 1051
	Paullinia carpopoda Cambess.	Woody climber	B.S. Amorim et al. 889
	Paullinia micrantha Cambess.	Woody climber	B.S. Amorim et al. 916
	Paullinia racemosa Wawra	Woody climber	D.S. Correia et al. 133
	Paullinia weinmaniifolia Mart.	Woody climber	D.S. Correia et al. 113
	Serjania glabrata Kunth	Woody climber	E.D. Mendonça et al. 62
	Serjania salzmanniana Schltdl.	Woody climber	B.S. Amorim et al. 1237
	Talisia esculenta (Cambess.) Radlk.	Tree	B.S. Amorim et al. 1291
	Talisia retusa R.S. Cowan	Tree	E.D. Mendonça et al. 65
Sapotaceae (Anderson Alves-Araújo)			
	Chrysophyllum gonocarpum (Mart. & Eichler *ex* Miq.) Engl.	Tree	D. Araújo et al. 1743
	Chrysophyllum splendens Spreng.	Tree	B.S. Amorim et al. 1773
	Pouteria nordestinensis Alves-Araújo & M. Alves	Tree	E. Pessoa et al. 509

Continued

Table 1. *Continued.*

Family	Species	Habit	Voucher
	Pradosia lactescens (Vel.) Radlk.	Tree	B.S. Amorim et al. 912
Schoepfiaceae (Bruno S. Amorim)			
	Schoepfia brasiliensis A. DC.	Shrub	B.S. Amorim et al. 1060
Simaroubaceae (Bruno S. Amorim)			
	Simarouba amara Aubl.	Tree	B.S. Amorim et al. 1289
Siparunaceae (Bruno S. Amorim)			
	Siparuna guianensis Aubl.	Tree	J.B.S. Oliveira et al. 102
Smilacaceae (Diogo Araújo)			
	Smilax syphilitica Humb. & Bonpl. *ex* Willd.	Woody climber	E.D. Mendonça et al. 72
Solanaceae (Maria F. Agra and Valéria Sampaio)			
	Aurelianea fasciculata (Vell.) Sendtn.	Shrub	B.S. Amorim et al. 1071
	Brunfelsia uniflora (Pohl) D.Don	Shrub	B.S. Amorim et al. 1039
	Cestrum axillare Vell.	Shrub	A. Melo et al. 693
	Cestrum sprucei Francey	Shrub	D. Araújo et al. 1883
	Dyssochroma viridiflorum (Sims) Miers	Shrub	E.D. Mendonça et al. 56
	Lycianthes pauciflora (Vahl) Bitter	Woody climber	B.S. Amorim et al. 1744
	Physalis angulata L.	Subshrub	B.S. Amorim et al. 1297
	Solanum acerifolium Dunal	Shrub	B.S. Amorim et al. 1255
	Solanum anisocladum Giacomin & Stehmann	Shrub	L.L. Giacomin et al. 1794
	Solanum asperum Rich	Shrub	A. Melo et al. 573
	Solanum asterophorum Mart.	Shrub	G.A. Gomes-Costa et al. 197
	Solanum capsicoides All.	Shurb	V.S. Sampaio et al. 76
	Solanum decompositiflorum Sendtn.	Shurb	V.S. Sampaio et al. 72
	Solanum maranguapense Bitter	Shrub	B.S. Amorim et al. 921
	Solanum paniculatum L.	Shrub	V.S. Sampaio et al. 79
	Solanum paraibanum Agra	Woody climber	B.S. Amorim et al. 1604
	Solanum reflexiflorum Moric. ex Dunal	Shrub	V.S. Sampaio et al. 71
	Solanum rugosum Dunal	Shrub	V.S. Sampaio et al. 77
	Solanum stipulaceum Willd. ex Roem. & Schult.	Shrub	V.S. Sampaio et al. 73
	Solanum sycocarpum Mart. & Sendtn.	Shrub	E. Pessoa et al. 478
Thymelaeaceae (Bruno S. Amorim)			
	Daphnopsis racemosa Griseb.	Shrub	B.S. Amorim et al. 1855
Turneraceae (Bruno S. Amorim & Andréia Zelenski)			
	Piriqueta racemosa (Jacq.) Sweet.	Herb	B.S. Amorim et al. 901
	Turnera aff. pernambucensis Urb.	Shrub	D. Araújo et al. 2375
Urticaceae (Bruno S. Amorim and Jéssica L. Viana)			
	Cecropia pachystachya Trécul	Tree	B.S. Amorim et al. 1094
	Laportea aestuans (L.) Chew	Herb	A. Melo et al. 691
	Pilea hyalina Fenzl	Herb	J.L. Viana et al. 289
	Porouma guianensis Aubl.	Tree	B.S. Amorim et al. 1763
	Urera baccifera (L.) Gaudich. *ex* Wedd.	Shrub	A. Melo et al. 455
Verbenaceae (Maria F. Agra and Jéssica L. Viana)			
	Citharexylum pernambucense Moldenke	Shrub	E.D. Mendonça et al. 50
	Lantana camara L.	Shrub	A. Melo et al. 623
	Lantana radula Sw.	Shrub	S.O. Santos et al. 304
Violaceae (Bruno S. Amorim)			
	Amphirrhox longifolia (A.St.-Hil.) Spreng.	Shrub	B.S. Amorim et al. 1837
	Noisettia orchidiflora (Rudge) Ging.	Herb	B.S. Amorim et al. 919
	Paypayrola blanchetiana Tul.	Shrub	B.S. Amorim et al. 1600
	Pombalia calceolaria (L.) Paula-Souza	Herb	B.S. Amorim et al. 939
	Rinorea guianensis Aubl.	Tree	J.L. Viana et al. 418
Vitaceae (Júlio Lombardi)			
	Cissus erosa Rich.	Woody climber	A. Melo et al. 745
	Cissus tinctoria Mart.	Woody climber	D.S. Lucena et al. 602
	Cissus verticillata (L.) Nicolson & C.E. Jarvis	Woody climber	A.M.M. Miranda and L.P. Félix 1566
Xyridaceae (Maria G. Wanderley)			
	Xyris jupicai Rich.	Herb	A. Melo et al. 662
Zingiberaceae (Jéssica L. Viana)			
	Renealmia alpina (Rottb.) Maas	Herb	J.L. Costa-Lima et al. 725
	Renealmia guianensis Maas	Herb	D. Araújo et al. 1763

Rubiaceae (20), Asteraceae (19) and Bromeliaceae (17).

The genera with the highest taxonomic diversity were *Miconia* Ruiz & Pav. and *Solanum* L. with 14 species each (corresponding to 46.7% of the species of Melastomataceae and 58.3% of Solanaceae), *Psychotria* L. with 13 species (30.9% of Rubiaceae) and *Epidendrum* L., *Eugenia* L., *Passiflora* L. and *Piper* L. with 11 species each (12.8% of Orchidaceae, 47.8% of Myrtaceae, 100% of Passifloraceae and 61.1% of Piperaceae).

The most representative structural group in the study area was "Herbs", totaling 355 spp. (42.6% of the total species) being most terrestrial (58.6%) or epiphytes and/or hemiepiphytes (34%). Almost 60% of species classified as "Herbs" belong to the following families of Monocotyledons: Orchidaceae, Bromeliaceae, Poaceae, Cyperaceae and Araceae.

The "Bushes" category includes 194 taxa (23.3% of the total species), being most represented in terms of number of species by Rubiaceae with 34 spp. (representing 17.5% of the species in the bushes category), followed by Solanaceae with 20 (10.3%), Melastomataceae with 18 (9.3%) and Malvaceae with 15 spp. (7.7%). Followed by "Trees and related forms" with 189 spp. (22.7% of all species) and was represented by Fabaceae with 24 spp. (12.6% of the Trees and related forms group), Myrtaceae with 22 (11.6%) and Melastomataceae with 14 spp. (7.4%).

"Climbers" completes the picture with 116 spp. (14% of total species in the area), of which 34 are herbaceous (29% of the species of Climbers) and the remainder woody (71%). The group is well represented by Fabaceae and Passifloraceae with 11 spp. each (9.5% each), Convolvulaceae with 10 (8.6%), Apocynaceae with nine (7.7%), Dioscoreaceae with eight (6.9%), Cucurbitaceae with seven (6%) and Asteraceae, Malpighiaceae and Sapindaceae with six species each (5.2% each).

Considering the substrate, most species of the area are "Terrestrial" with 676 spp. (81.2% of all species) and comprise several families. The second most representative group are "epiphytic and hemiepiphytic" with 124 spp. (about 15% of the total species) and the greatest diversity among Orchidaceae (53.2% of epiphytes and hemiepiphytes), Bromeliaceae (25.8%) and Araceae (9.7%) and Piperaceae (5.6%). These are followed by the "Saxicolous" group, represented by 47 spp. (5.6% of all species), and families with the most species were Bromeliaceae (30% of saxicolous species), Orchidaceae (19.1%), Begoniaceae and Gesneriaceae (6.4% each). "Aquatic and wetland" plants are represented by 21 spp. (2.5% of total species), among which Cyperaceae has seven spp. (33.3% of aquatic and wetland species), Lentibulariaceae and Linderniaceae two species each (9.5% each) and the rest of the families have only one species.

Regarding the source of nutrition, only 13 species (1.5% of total species) found are "hemiparasitic" or "mycoheterotrophic"; of these, eight species (61.5%) are "hemiparasitic", belonging to the families Loranthaceae (4 spp.), Orobanchaceae (1 spp.) and Santalaceae (3 spp.), and five species (38.5%) are "mycoheterotrophic", with representatives in Burmanniaceae and Gentianaceae (2 spp. each) and Orchidaceae (1 sp.).

About 15% of the total species of Serra do Urubu (122 spp.) are considered, according to the Lista de Espécies da Flora do Brasil (2015), as endemic to the Atlantic Forest. It is worth mentioning that Bromeliaceae (26 spp.), Orchidaceae (20 spp.), Myrtaceae (8 spp.), Solanaceae (7 spp.) and Marantaceae (5 spp.) together account for over 50% of cases. Among this same set of species, four are known only from forest remnants of the states of Bahia and Pernambuco (*Rauvolfia moricandii* A. DC., Apocynaceae; *Begonia obdeltata* Gregório & E.L. Jaques, Begoniacae; *Heteropterys cordifolia* Moric. *ex* A. Juss., Malpighiaceae; and *Peperomia estrellensis* DC., Piperaceae) and 23 are considered to be restricted to the Pernambuco Endemism Center (*sensu* Prance 1987), with 10 known only from the state.

A disjunct distribution between the Amazon and Atlantic Forests has been confirmed for 10.6% of the species in the area. Among the families with this distribution pattern are Orchidaceae with 24 spp. (22.7% of the cases of disjunction), Fabaceae with seven (8%), Bromeliaceae, Melastomataceae and Piperaceae with four (4.5% each), Lecythidaceae and Violaceae with three species each (3.4% each). Some examples are the following: Lecythidaceae — *Eschweilera ovata* (Cambess.) Mart. *ex* Miers, *Lecythis lurida* (Miers) S.A. Mori and *L. pisonis* Cambess.; Bromeliaceae — *Aechmea mertensii* (G.Mey.) Schult. & Schult.*f.*; Annonaceae — *Cymbopetalum brasiliensis* (Vell.) Benth. *ex* Baill.; Menispermaceae — *Hyperbaena domingensis* (DC.) Benth.; and Piperaceae — *Peperomia glabella* (Sw.) Dietr.

DISCUSSION

The Serra do Urubu has the biggest taxonomic richness (832 taxa) when compared with other floristic surveys in the state of Pernambuco (Table 2) (Guedes 1998; Rodal et al. 2005a, 2005b; Rodal and Sales 2007; Sacramento et al. 2007; Ferraz and Rodal 2008; Cavalcanti 2012; Alves et al. 2013). The Serra do Urubu slightly exceeds the total number of species only an area of lowland forest in the north of the state, whose inventory has been continuously updated since 2008 and was recently updated to 830 species of angiosperms (Alves-Araújo et al. 2008; Melo et al. 2011; Alves et al. 2013).

The difference is even more striking when the data presented here are compared with floristic inventories of areas of submontane and montane forests of Pernambuco (Rodal et al. 2005b; Rodal and Sales 2007; Ferraz and Rodal 2008), even after considering the

Table 2: Comparison with other floristic surveys in the Brazilian Northeast.

Study area (state, locale)	Vegetation	Number of species / families	Most representative families	Reference
Pernambuco, Serra do Urubu	Montane Forest (600–780 m)	832 / 118	Orchidaceae (86 spp), Fabaceae (51 spp.), Rubiaceae (42 spp.), Bromeliaceae (41 spp.) and Poaceae (40 spp.)	This work
Pernambuco, Mata do Estado	Submontane / Montane Forest (200–640 m)	375 / 94	Fabaceae (34), Myrtaceae (21), Rubiaceae (20), Lauraceae and Sapindaceae (14).	Ferraz and Rodal 2008
Pernambuco, Reserva Municipal de Bonito	Submontane Forest (450–500 m)	217 / 65	Fabaceae (26), Asteraceae and Euphorbiaceae (14), Melastomataceae and Rubiaceae (13).	Rodal et al. 2005b
Pernambuco, Parque Ecológico João Vasconcelos-Sobrinho	Submontane Forest (800–950 m)	332 / 85	Fabaceae (51), Asteraceae (20), Rubiaceae (19), Solanaceae (14), Myrtaceae (13).	Rodal and Sales 2007
Pernambuco -Usina São José	Lowland Forest (60–150 m)	830 / 113	Fabaceae (87), Poaceae (54), Cyperaceae (40), Rubiaceae (34), Orchidaceae and Melastomataceae (29).	Alves et al. 2013
Paraíba, Reserva Ecológica Mata do Pau Ferro	Submontane Forest (400–600 m)	309 / 84	Fabaceae (30), Rubiaceae (24), Malvaceae (21), Solanaceae (16) and Asteraceae (14).	Vasconcelos et al. 2004
Ceará, Serra do Baturité	Submontane / Montane Forest (400–800 m)	419 / 89	Myrtaceae (52), Fabaceae (41), Euphorbiaceae (23), Rubiaceae (21), Lauraceae (13).	Araújo et al. 2007
Bahia, Serra do Corcovado	Submontane / Montane Forest (400–1040 m)	678 / 100	Orchidaceae (69), Rubiaceae (46), Bromeliaceae (33), Fabaceae (30), Melastomataceae (28).	Coelho and Amorim 2014
Bahia, Serra da Pedra Lascada	Montane Forest (600–950 m)	466 / 88	Orchidaceae (42), Rubiaceae (41), Bromeliaceae (30), Melastomataceae (27), Poaceae (23).	Coelho and Amorim 2014
Bahia, Serra das Lontras	Submontane / Montane Forest (400–1,000 m)	792 / 110	Orchidaceae (108), Bromeliaceae (62), Rubiaceae (57), Melastomataceae (45), Myrtaceae and Asteraceae (33 each).	Amorim et al. 2009; Leitman et al. 2014
Bahia, Serra Bonita	Submontane / Montane Forest (300–1,080 m)	628 / 103	Orchidaceae (52), Rubiaceae (44), Melastomataceae (37), Asteraceae (33), Poaceae (28).	Amorim et al. 2009
Bahia, Serra do Teimoso	Montane Forest (850 m)	667 / 100	Fabaceae (51), Myrtaceae (39), Rubiaceae (31), Orchidaceae (25), Sapotaceae and Solanaceae (24 each).	Amorim et al. 2005
Bahia, Reserva Biológica do Una	Lowland and Submontane Forest (100–350 m)	947 / 108	Fabaceae (71), Rubiaceae (66), Myrtaceae (59), Bromeliaceae (40) and Orchidaceae (38).	Amorim et al. 2008

size difference of fragments. For example, the region of Serra do Urubu studied here has more than twice as many species recorded in an area of the municipality of São Vicente Férrer (Ferraz and Rodal 2008), which had until now held the record for the greatest number of species for this type of vegetation in the state. The high floristic diversity of the Serra do Urubu is also reflected in other groups of plants such as ferns and lycophytes, which according to Barros et al. (2006), have more than 40% of the species cataloged for Pernambuco occurring in the PRNP Frei Caneca.

In relation to similar inventories conducted in montane forests in the Northeast, the number of recorded species is compatible with values obtained by Amorim et al. (2009), Coelho and Amorim (2014) and Leitman et al. (2014), in areas of southern Bahia (412–792 species) and which are recognized for the high diversity and high levels of endemism in their floras. In addition, the richest fragments in the studies mentioned are of sizes comparable with the fragments of the Serra do Urubu (Table 2). Nevertheless, forest fragments in southern Bahia with more than 2000 ha still have lower species richness than the Serra do Urubu (Amorim et al. 2009; Coelho and Amorim 2014; Leitman et al. 2014).

The richness of plants in the Serra do Urubu is comparable to the Una Biological Reserve, located in southern Bahia and home to a mosaic of environments consisting of submontane forest, "tabuleiro" vegetation, mangrove, flooded and disturbed areas. The Una Biological Reserve has 947 species of angiosperms cataloged over 10 years of sampling effort. This region stands as the most species-rich area in northeastern Brazil (Amorim et al. 2008). However, excluding species that are unique to "tabuleiro" and mangroves, 737 species have been cataloged for the submontane region of Una, which makes the species richness of the Serra do Urubu and Rebio UNA comparable.

The most diverse families in number of species in the Serra do Urubu (Orchidaceae, Fabaceae, Rubiaceae, Bromeliaceae, Poaceae, Asteraceae, Melastomataceae and Solanaceae) were also the most species-rich in floristic studies of montane areas in southern Bahia, such as in the Serra do Corcovado (Coelho and Amorim 2014), Serra Bonita and Serra das Lontras (Amorim et al. 2009; Leitman et al. 2014). A similar pattern of richness was found in Una where Fabaceae, Rubiaceae, Myrtaceae, Bromeliaceae, Orchidaceae and Melastomataceae were the most species-rich families, listed in descending order.

On the other hand, in studies carried out in Pernambuco by Rodal et al. (2005b), Rodal and Sales (2007) and Ferraz and Rodal (2008), Orchidaceae was poorly sampled and represented only 3.2–1.5% of the flora, while in the Serra do Urubu Orchidaceae represents 10.3% of the total number of species recorded. A proportion similar to this has been shown for areas of Bahia, wherein Orchidaceae account for between 8.2% and 10.2% of the flora (Amorim et al. 2009; Coelho and Amorim 2014; Leitman et al. 2014). Furthermore, the richness of the family in the Serra do Urubu is among the greatest ever recorded in floristic surveys in the

Northeastern Brazil. These differences are probably due to different sampling efforts concentrated on the arboreal layer of the areas of Pernambuco. However, one cannot fail to consider the effect of fragmentation and human pressures on the species, besides the difference in the size of the fragments among the studied areas.

Fabaceae emerges at different proportions in the various studies performed in Atlantic Forest fragments, despite being one of the most representative families in montane areas of Pernambuco (Rodal et al. 2005b; Rodal and Sales 2007; Ferraz and Rodal 2008) and Bahia (Amorim et al. 2005, 2009; Coelho and Amorim 2014). In the Serra do Urubu, the family accounts for about 6.1% of total species, while in the Mata do Brejão (Rodal et al. 2005b) and the Municipal Park Vasconcelos Sobrinho (Rodal and Sales 2007), its proportion ranges from 12–15.6%. This difference is suggested here to be due to a small sampling of non-arboreal structural groups in Rodal et al. (2005b) and Rodal and Sales (2007), as observed for Orchidaceae and Cyperaceae, among other families.

It is important to point out that, for various reasons, there is a clear bias directed to the effort of collecting woody species (including trees, woody climbers and shrubs) in some studies, which usually leads to low sampling of species from other groups, such as herbaceous plants. This is evidenced in Ferraz and Rodal (2008), in which members of the woody group represented 64.5% of the recorded species. On the other hand, when the same sampling effort is performed for other strata of the forest, richness patterns emerge similar to those seen in the Serra do Urubu. Thus, in Rodal et al. (2005b) and Rodal and Sales (2007), trees represent 25% and 35.7% of the species sampled in the areas, respectively, which is close to a value found here. In addition, Fabaceae, Rubiaceae and Myrtaceae are among the most representative families in these works (Rodal et al. 2005b; Rodal and Ferraz 2007; Ferraz and Rodal 2008).

The most representative of structural groupings was "Herbs", followed by "Bushes" and "Trees and related forms", corroborating the findings of Amorim et al. (2009) and Coelho and Amorim (2014) in inventories in montane forests in Bahia. In both those studies, Orchidaceae is identified as the richest family in number of species, followed by Rubiaceae, Bromeliaceae, Fabaceae, Myrtaceae, Melastomataceae and Solanaceae, findings which were also found in the Serra do Urubu.

The similarities also apply to climbers. Rodal et al. (2005b), Rodal and Ferraz (2007), Ferraz and Rodal (2008), this functional group is 10–15% of the flora in their respective study areas, a pattern into which the Serra do Urubu fits nicely at 14% . The distribution of species richness of climbers into families is also similar, where Fabaceae is among the most representative together with Cucurbitaceae, Dioscoreaceae and Sapindaceae. However, in the Serra do Urubu this group also includes Passifloraceae, Apocynaceae, Convolvulaceae, Asteraceae and Malpighiaceae.

Plants with differentiated forms of nutrition (hemiparasitic, parasitic or mycoheterotrophic) are usually represented by only a few species or absent in floristic inventories. No mycoheterotrophic species were recorded in montane and submontane areas of Pernambuco by Rodal et al. (2005b), Rodal and Ferraz (2007) and Ferraz and Rodal (2008), who recognized only hemiparasitic species of the families Loranthaceae and Santalaceae. In these works, the hemiparasites were represented by one or up to four species, while eight species have been recorded in the Serra do Urubu. Araújo et al. (2007), in the Serra do Baturité (Ceará state), also recorded hemiparasitic species of Loranthaceae and a species of Balanophoraceae (*Langsdorffia hypogaea* Mart.). Meanwhile, Barbosa et al. (2004), working in a montane forest area in Areia (Paraíba state), cataloged species of hemiparasite and mycoheterotrophy but also cited *Cuscuta racemosa* Mart. (Convolvulaceae), a parasitic species that was not recorded in other studies. In areas of southern Bahia (Amorim et al. 2005, 2008, 2009; Coelho and Amorim 2014), hemiparasites are represented with three to nine species in these same families (Lorantahecae and Santalaceae), in addition to parasitic species such as *Helosis cayennensis* (Sw.) Spreng. (Balanophoraceae) and mycoheterotrophic species (e.g., *Gymnosiphon divaricatus* (Benth.) Benth. & Hook. *f.* [Burmanniaceae] and *Voyria flavescens* Griseb. [Gentianaceae]). The mycoheterotrophic species recorded in this study *Campylosiphon purpurascens* Benth. (Burmanniaceae) and *Wullschlaegelia aphylla* (Sw.) Rchb. *f.* (Orchidaceae) were previously known only from single records collected 40 years ago in the state of Pernambuco from other areas of montane forests in the state (Melo and Alves 2013).

The rock outcrops in the Serra do Urubu are generally at the summit of the mountain, and have been given particular names, such as Pedra do Cruzeiro, which is an access point for visitors. Some species recorded in the Serra do Urubu are restricted to these environments, among which are *Ortophytum disjunctum* L.B. Sm. (Bromeliaceae), *Paepalanthus myocephalus* Mart. *ex* Körn. (Eriocaulaceae), *Euphorbia comosa* L. (Euphorbiaceae) and *Sobralia liliastrum* Salzm. *ex* Lindl. (Orchidaceae). These species have also been recorded in other floristic surveys of rock outcrops in Pernambuco (Gomes and Alves 2010; Gomes and Sobral-Leite 2013; Pessoa and Alves 2014). Other examples are *Mandevilla dardanoi* M.F. Sales, Kin.-Gouv. & A.O. Simões (Apocynaceae), *Paliavana tenuiflora* Mansf. and *Sinningia nordestina* Chautems, Baracho & J.A. Siqueira (Gesneriaceae), which are considered restricted to areas of rock outcrops of the Borborema Plateau and its extensions (Sales et al.

2006; Gomes and Alves 2009, 2010; Araújo et al. 2015).

Our results also provide significant advances in the floristic knowledge of the region and on the distribution of species in the northern Atlantic Forest. With this list there was a considerable increase in the number of listed species from Serra do Urubu, as Cardoso et al. (2006) and Grillo et al. (2006) recorded 241 species of flowering plants in the PRNP Frei Caneca. In addition, our results improved the initial checklists of these authors with the not inclusion of 86 species because we had not been located neither the field nor herbaria. Families with the most corrections were Orchidaceae with 17 species, followed by Fabaceae with 11 and Bromeliaceae with seven. These improvements work together to enhance our knowledge of the biodiversity of the area and for future management plans of the protected area.

Based on the *Lista de Espécies da Flora do Brasil* (2015) and local floras (Sales et al. 1998; Ferraz and Rodal 2008; Almeida-Júnior et al. 2009; Gomes and Alves 2010; Amorim and Alves 2012a, 2012b, 2012c; Amorim et al. 2012; Chagas 2012; Alves et al. 2013; Buril 2013; Oliveira and Alves 2013; Sampaio 2013; Viana and Barbosa 2013; Costa-Lima 2014; Pereira 2014; Pessoa and Alves 2015b), it was found that 25 spp. (about 3% of the total cataloged for the Serra do Urubu) are new records for the state of Pernambuco. This increase to the flora of the state includes families such as Fabaceae (6 spp.), Piperaceae, Poaceae and Rubiaceae (3 spp. each) and Myrtaceae (2 spp.). These results reiterate the importance of the study of local-regional floras for increasing knowledge of plant diversity in the northern portion of the Atlantic Forest.

As to the proportion of species endemic to the Atlantic Forest, the present study found that 15% of species have this distribution pattern, which is well below that found by Coelho and Amorim (2014), who verified that more than 37% of species listed by them are endemic to this domain. Meanwhile, the proportion of species found with disjunct distributions between the Amazon and Atlantic Forest is 10%, which is similar to that found by Rodal et al. (2005b) and Coelho and Amorim (2014). Amorim et al. (2009) indicated that this value is similar to what is found in lowland areas of southern Bahia; however, they also found a decrease in this ratio with increased altitude.

The families Bromeliaceae, Orchidaceae, Myrtaceae and Marantaceae had the greatest number of species endemic to the Atlantic Forest in our results. These families are also among those with the greatest proportion of endemic species of all families recorded in this area according to Stehmann et al. (2009) and the *Lista de Espécies da Flora do Brasil* (2015). More than 88% of Bromeliaceae species present in the Atlantic Forest are endemic to this domain, followed by Myrtaceae with 77.2%, Marantaceae with 73.15%, Melastomatecae with 71%, Orchidaceae with 68.3% and Rubiaceae with 58% (Lista de Espécies da Flora do Brasil 2015), an overall pattern of the Atlantic Forest reflected at the local level in the Serra do Urubu.

Ferraz et al. (2004) considered some species recorded here as characteristic of the montane forests of Pernambuco, among them: *Couepia impressa* Prance (Chrysobalanaceae), *Erythroxylum mucronatum* Benth. (Erythroxylaceae), *Margaritaria nobilis* L. f., *Senefeldera verticillata* (Vell.) Croizat. (Euphorbiaceae), *Myrsine guianensis* (Aubl.) Kuntze (Primulaceae), *Cinnamomum triplinerve* (Ruiz & Pav.) Kosterm. (Lauraceae), *Lecythis lurida* (Miers.) S.A. Mori (Lecythidaceae), *Hyeronima oblonga* (Tul.) Müll.Arg. (Phyllanthaceae), *Quiina cruegeriana* Griseb. (Quiinaceae), *Rubus brasiliensis* Mart. (Rosaceae), *Allophyllus racemosus* Sw. (Sapindaceae), *Symplocos neglecta* Brand (Symplolacaceae) and *Urera baccifera* (L.) Gaudich. ex Wedd. (Urticaceae). However, *Cinnamomum triplinerve*, *Erythroxylum mucronatum* and *Quiina cruegeriana* are also present in lowland areas (Alves-Araújo et al. 2010; Oliveira and Alves 2013; Costa-Lima 2014) and *Myrsine guianensis* is commonly found in *restinga* plant formations of coastal Brazil (Freitas and Carrijo 2008; Almeida Jr. et al. 2009; Alves et al. 2013). Furthermore, *Hyeronima oblonga* is a species found in montane forests (Rebster and Huft 1988), as is Symplocaceae, which is more species-rich in the Brazilian Southeast and South (Fritsch et al. 2008; Aranha-Filho and Pedreira 2009).

Myrtaceae is usually indicated among the most species-rich families and as an important component in the tree layer (Oliveira-Filho and Fontes 2000; Amorim et al. 2008; Coelho and Amorim 2014). The number of species occurring in submontane and montane forests in relation to lowland forests is similar, but different in composition. *Eugenia hirta* O. Berg and *Myrciaria ferruginea* O. Berg are common in the understory of lowland forests of Pernambuco (Amorim and Alves 2011) but absent in submontane and montane forests, as is also the case with *Marlierea excoriata* Mart., *Myrcia bergiana* O. Berg , *Myrcia densa* (DC.) Sobral and *Psidium cattleianum* Afzel *ex* Sabine (Amorim and Alves 2012c). Although there are species shared by both environments, some are exclusive to submontane and montane forest in Pernambuco, such as *Eugenia culicina* Sobral, *E. submontana* B.S. Amorim & M. Alves and *Myrcia amplexicaulis* (Vell.) Hook.f. (Amorim and Alves 2012, 2015; Sobral 2013).

The presence of species occurring in montane and lowland forests reveals the transitional nature of the Serra do Urubu, which stands at the altitudinal limit adopted for characterization of submontane and montane forests. This position may be one of the factors contributing to the high species richness found in this study. Ferraz et al. (2008) found evidence that the submontane forests of the Serra da Borborema have

a transitional pattern between lowland and montane forests, following the same trend of altitudinal gradients recorded by Gentry (1988).

The high richness of some families in the Serra do Urubu and other montane and submontane forests in the Northeastern Brazil (Amorim et al. 2009; Coelho and Amorim 2014) is distinct from lowland areas. Orchidaceae and Bromeliaceae, well-sampled here and in the cited studies, have less richness in the checklists produced by Guedes (1998), Rodal et al. (2005a), Soares-Júnior et al. (2008) and Alves et al. (2013). In southeastern Brazil, according to Oliveira-Filho and Fontes (2000), the number of species of Chrysobalanaceae, Sapotaceae, Rutaceae and Moraceae tends to decrease with increasing altitude, while for Asteraceae, Melastomataceae, Primulaceae and Solanaceae the numbers tend to increase. This assertion is partially corroborated in the Serra do Urubu, where Chrysobalanaceae and Sapotaceae are poorly represented (one and three species, respectively), while in the Usina São José, a lowland forest area in northern Pernambuco state (Alves et al. 2013), six and 18 species have been cataloged, respectively. The same difference of number of species in these areas does not fully apply to Rutaceae and Moraceae (Alves et al. 2013). Primulaceae and Solanaceae are richer in Serra do Urubu than in Usina São José, partially corroborating the findings of Oliveira-Filho and Fontes (2000). Meanwhile, Asteraceae and Melastomataceae are represented by the same number of species in the two areas mentioned. Amorim et al. (2009) pointed out that Burseraceae, Combretaceae and Connaraceae are better represented in lowland areas than in montane and submontane areas of Bahia. However, comparing the floristic checklists of Usina São José (Alves et al. 2013) and Serra do Urubu, this assertion is not confirmed. It is noteworthy that some families such as Bignoniaceae and Polygalaceae are more diverse in lowland forests (Alves et al. 2013), unlike Gesneriaceae and Begoniaceae that are richer in middle and high elevation areas (Clement et al. 2004; Perret et al. 2013). Piperaceae is another example of the richness of the flora of Serra do Urubu being more pronounced in higher altitude forests than in lowland forests (Guedes 1998; Sacramento et al. 2007; Soares Jr. et al. 2008; Alves et al. 2013). In addition, some examples are representative, such as *Peperomia glabella* (Sw.) Dietr., which in the Northeast is known only from montane areas in the states of Ceará (Serra do Baturité and Maranguape) and Bahia (Serra Bonita and Serra das Lontras) (Guimarães and Giordano 2004; Amorim et al. 2009), *P. pseudoestrellensis* C. DC., which in the Northeast has been recorded only in southern Bahia (Amorim et al. 2009; Leitman et al. 2014), and *P. increscens* Miq., which occurs in higher areas in the state (Gomes and Alves 2010).

According to the *Livro Vermelho da Flora do Brasil* (2013), 10 species recorded in the area are under some degree of threat: *Phragmipedium sargentianum* Rolfe (Orchidaceae), Threatened with Extinction; *Aechmea gustavoi* J.A. Siquerira & Leme (Bromeliaceae), Critically Endangered; *Canistrum auratiacum* E. Morr., *Neoregelia pernambucana* Leme & J.A. Siqueira and *Vrisea wawranea* Antoine (Bromeliaceae), *Campylocentrum pernambucense* Hoehne and *Octomeria alexandri* Schltr. (Orchidaceae), Endangered; and *Canistrum pickelii* (A.Lima & L.B.Sm.) Leme & J.A.Siqueira, *Guzmania monostachia* (L.) Rusby ex Mez. (Bromeliaceae), *Cattleya labiata* Lindl., *C. granulosa* Lindl. (Orchidaceae) and *Euterpe edulis* Mart. (Arecaceae), Vulnerable. Additionally, the *Lista de Espécies da Flora do Brasil* (2015) contains six species considered Near Threatened, they are: *Anthurium bromelicola* Mayo & L.P. Félix (Araceae), *Bowdichia virgilioides* Kunth. (Fabaceae), *Hortia brasiliana* Vand. ex DC. (Rutaceae), *Lacistema robustum* Schnizl. (Lacistemataceae), *Ocotea puberula* (Rich.) Nees (Lauraceae) and *Zygostates bradei* (Schltr.) Garay (Orchidaceae). Aside from *Vrisea wawranea*, which was cataloged here only from herbarium material, the other species mentioned above were observed in their natural habitat. *Canistrum auratiacum*, *C. pickelii*, *Euterpe edulis* and *Lacistema robustum* are restricted to the understory of higher altitude areas of the Serra do Urubu. Furthermore, Giulietti et al. (2009) considered *Canistrum auratiacum*, *Neoregelia pernambucana* (Bromeliaceae), *Dichanthelium assurgens* (Poaceae) and *Borreria decipiens* (Rubiaceae) as rare species.

In addition to sheltering a large contingent of endangered species, the Serra do Urubu has its relevance to conservation highlighted by the fact that it supports significant portions of biodiversity of ecologically important families of the Atlantic Forest and the flora of Pernambuco state. In this sense, the family Bromeliaceae has 17 genera and 41 species occurring in the area which represents 85% of the genera and 40% of the species recorded for Pernambuco (Forzza et al. 2015). In turn the Serra do Urubu supports 61.5% of the genera and 39% of the species of Orchidaceae occurring in the state of Pernambuco (Barros et al. 2015; Pessoa and Alves 2015b) and harbors 26.4% of all species of Myrtaceae recorded in the state. Other families of less floristic relevance also have a significant portions of their biodiversity in Pernambuco preserved in the Serra do Urubu. Such is the case with Gesneriaceae, where all genera and 80% of the species occurring in Pernambuco, Marantaceae with 42.3% of the species occurring in the state, Piperaceae with 42.8%, Melastomataceae with about 46%, Violaceae with 55.6% and Passifloraceae with 68.75% of its species in the state are recorded in the Serra do Urubu (Lista de Espécies da Flora do Brasil 2015).

Furthermore, in the last 10 years (2004–2014) more than 15 new species of angiosperms occurring in the

area have been described, some of which were found in the production of this floristic inventory (Chautems et al. 2005; Leme and Siqueira Filho 2006; Sales et al. 2006; Amorim and Alves 2012a, 2015; Costa-Lima and Alves 2013; Giacomin et al. 2013; Sobral 2013; Gregório et al. 2014; Pessoa et al. 2014a, 2014b, 2015a). Some taxa are known only from their populations in Serra do Urubu, such as *Vrisea barbosae* J.A. Siqueira & Leme, *V. freicanecana* J.A. Siqueira & Leme — Bromeliaceae (Leme and Siqueira-Filho 2006), *Eugenia submontana* B.S. Amorim & M. Alves (Amorim and Alves 2015), *Campylocentrum serranum* E. Pessoa & M. Alves and *Specklinia integripetala* E. Pessoa & F. Barros — Orchidaceae (Pessoa et al. 2014a; Pessoa and Alves 2015a) or from only a few other locations, such as *Aechmea pernambucentris* J.A. Siqueira & Leme (Leme and Siqueira-Filho 2006), *Erythroxylum umbrosum* Costa-Lima & M. Alves — Erythroxylaceae (Costa-Lima and Alves 2013), *Eugenia culucina* Sobral (Sobral 2013), *Eugenia tumescens* B.S. Amorim & M. Alves — Myrtaceae (Amorim and Alves 2012a) and *Epidendrum sanchezii* E. Pessoa & L.P. Felix — Orchidaceae (Pessoa et al. 2014b).

Conclusions

This work confirms that Serra do Urubu is an area of high relevance to the diversity of angiosperms in the Brazilian Northeast, aligning itself with the indications of several other biological groups. Furthermore, the Serra do Urubu harbors many species restricted to the Pernambuco Endemism Center and with some degree of threat. It is confirmed, therefore, that the Serra do Urubu is a center of diversity in the northern part of the Atlantic Forest and corroborates the Pernambuco Endemism Center based on the floristic composition of the families Bromeliaceae, Erythroxylaceae, Myrtaceae and Orchidaceae.

Floristic diversity patterns are reinforced and highlighted that will help build a broader picture of the composition of the angiosperms of the northern portion of the Atlantic Forest. Among the patterns highlighted and corroborated in this study are the relevance of the major angiosperm families common to the Atlantic Forest, the proportionality between the various morpho-functional and ecological groups and the floristic connections of the submontane and montane Atlantic Forest in several areas of the Brazilian Northeast.

The importance of the area is highlighted by this study for preservation efforts at both the regional and national levels due to the diversity and representation of key groups of the Atlantic Forest.

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